HOBART

SERVICE

SERVICE MANUAL

18256

Legacy ™

HL300	**ML-134351**
HL300C	**ML-134358**
HL400	**ML-134348**
HL400C	**ML-134359**

- NOTICE -

This Manual is prepared for the use of trained Hobart Service Technicians and should not be used by those not properly qualified. If you have attended a Hobart Service School for this product, you may be qualified to perform all the procedures described in this manual.

This manual is not intended to be all encompassing. If you have not attended a Hobart Service School for this product, you should read, in its entirety, the repair procedure you wish to perform to determine if you have the necessary tools, instruments and skills required to perform the procedure. Procedures for which you do not have the necessary tools, instruments and skills should be performed by a trained Hobart Service Technician.

A product of HOBART Troy, Ohio 45374

F25250 (August 2007)

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GENERAL

INTRODUCTION

The HL300 and HL400 mixers utilize a timer board with digital display for the operator interface; and electronic motor drive to control the operation of the mixer.

The timer board allows the operator to select the desired mix time and mix speed for the product. The electronic motor drive stores the last selected mix time for each speed setting. Continuous mixing with count up timing is also available when the Hold Mode is selected.

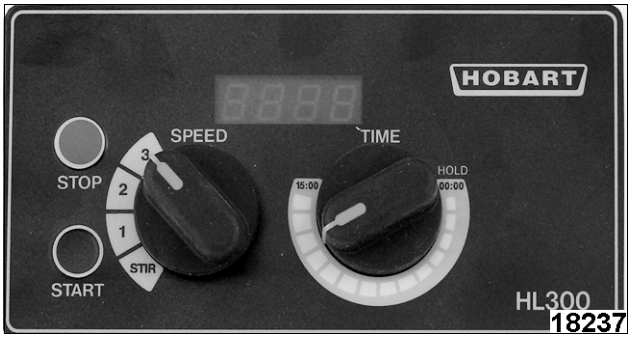
The HL300 and HL400 models are available with an optional programmable recipe timer board. A mixer with the recipe timer board allows for the same operation but includes programing options for the operator to store and retrieve up to four recipes with five steps each for the HL300 and six recipes with six steps each for the HL400.

The electronic motor drive provides high torque variable speed output from the motor to fixed ratio drive gears. By utilizing the motor drive technology, agitator speed is controlled electronically which permits changing mixing speeds anytime during mixer operation.

REFERENCE MATERIAL

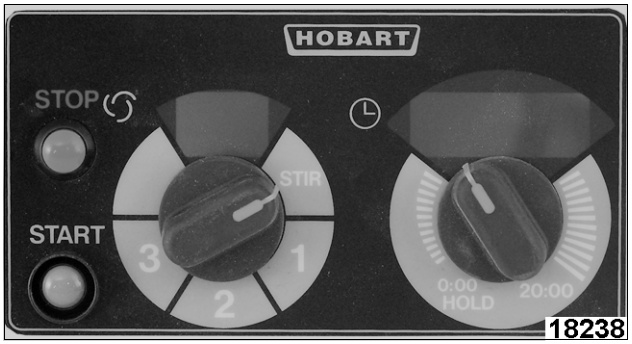
- HL300 Catalog of Replacement Parts - F43136
- HL400 Catalog of Replacement Parts - F43137
- Instruction Manual for Installation, Operation and Care - F34975
- Lubrication Manual for current lubricants and quantities - F20067
- Use and Applications Handbook - F34901
- Mixer Capacity Chart - All Models - F7701

TIMER OPTIONS

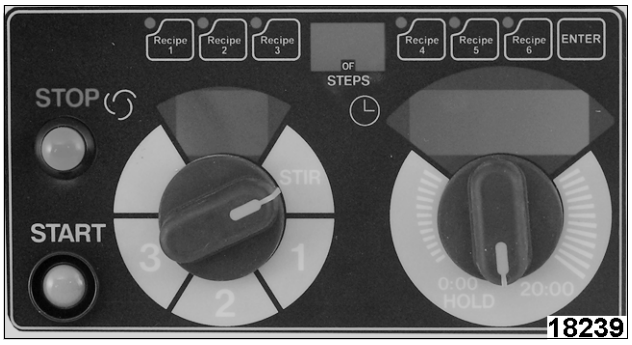


HL300 STANDARD TIMER BOARD

HL300 RECIPE TIMER BOARD



HL400 STANDARD TIMER BOARD



HL400 RECIPE TIMER BOARD

SPECIFICATIONS

HL300 ELECTRICAL DATA				
Voltage*	100-120/50/60/1	200-240/50/60/1	200-240/50/60/3	380-460/50/60/3
Amps	9.5	5.7	2.8	1.4
Mixer	0.75 H.P.	0.75 H.P.	0.75 H.P.	0.75 H.P.
Motor	2.5HP, 230/460V, 3 phase	2.5HP, 230/460V, 3 phase	2.5HP 230/460V, 3 phase	2.5HP, 230/460V, 3 phase
*Tolerance +/- 10%				

HL400 ELECTRICAL DATA			
Voltage*	200-240/50/60/1	200-240/50/60/3	380-460/50/60/3
Amps	9.3	5.6	2.4
Mixer	1.5 H.P.	1.5 H.P.	1.5 H.P.
Motor	3.0HP. 208-230/460V, 3 Phase	3.0HP. 208-230/460V, 3 Phase	3.0HP. 208-230/460V, 3 Phase
*Tolerance +/- 10%			

OPERATING SPEEDS AND RPM				
Model	**Speed**	**Planetary**	**Beater**	**Attachment**
HL300	STIR	25	58	34
	1	41	94	55
	2	77	174	101
	3	140	317	185
HL400	STIR	25	58	34
	1	41	94	55
	2	77	174	101
	3	140	317	185

BOWL SIZE	
HL300	30 qt. bowl
HL400	40 qt. bowl

MIXER TORQUE VALUES	
Component	**Torque**
Base to Pedestal	900-1100 in*lb
Transmission Case to Pedestal	372-465 in*lb
Slideways to Pedestal	175-275 in*lbs
Internal Gear to Transmission Case	175-275 in*lbs
Transmission Cover Bolts	175-275 in*lbs
Motor to Transmission Case	24-30 in*lbs
Bottom Planetary Screw	372-465 in*lbs

MOTOR DRIVE TORQUE VALUES		
Location	**Screw Size**	**Torque**
Main Circuit Screws: L1/L, L2/N, GND; U, V & W	M3.5	10.5 in*lb
Control Circuit Screws: Y1, Y1E, PLC, X1, X2, X3 11, 12, 13, FWD, & CM	M2	1.8 in*lb
Control Circuit Screws: 30B & 30C	M2.5	3.5 in*lb

LUBRICATION

Component	Lubrication	Quantity
Transmission Case	Mobilith AW- 2 grease	40 oz.
Planetary	Chevron FM EP-2 grease	Coat beater pinion
Planetary Casting Void (area between agitator shaft bearings)	Chevron FM EP-2 grease	2/3 full
Internal Gear	Chevron FM EP-2 grease	Coat
Motor bearings	Pre-lubricated	---
Slideways	Lubriplate 630-AA	Light coat mating surfaces
Beater Shaft Bearings	Pre-lubricated	—

TOOLS

Standard

- Standard set of hand tools.
- Digital Multi-meter (DMM) with sensitivity of at least 20,000 ohms per volt.
- Clamp-on ammeter

Special

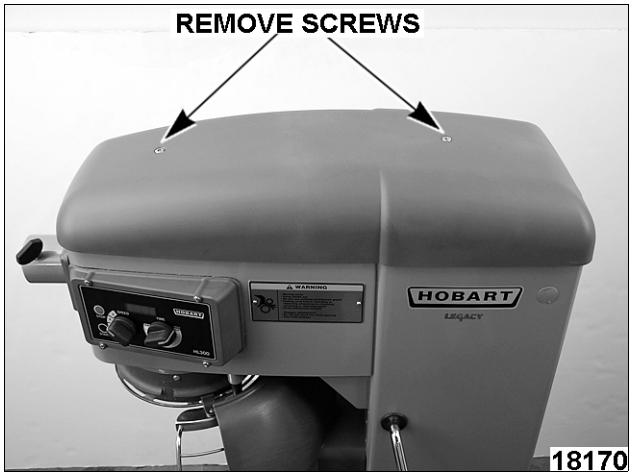
- Permatex #2 Part No. 508462. Used to seal cover to transmission case.
- RTV 732 Dow clear silicone Part No. 513886 or equivalent. Used to secure bowl guard switch to switch holder.
- RTV 732 Dow grey silicone Part No. 515194 or equivalent. Used to fill seam between wrap and column.
- Drive Bleeder Tool Part No. 874561 (wire wound resistor in PVC housing with probes). Used to bleed down motor drive bus circuit voltage.
- Field service grounding kit Part No. TL-84919.
- 2.0" long bolts (2) required (full thread, hardened preferred). Used as jack screws to lift transmission cover.
- Torque wrench capable of measuring up to 1200 in*lb.

COVERS

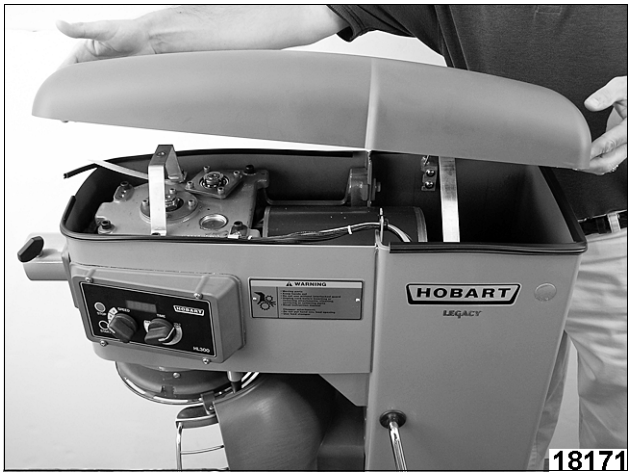
TOP COVER

WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

1. Remove top cover screws.

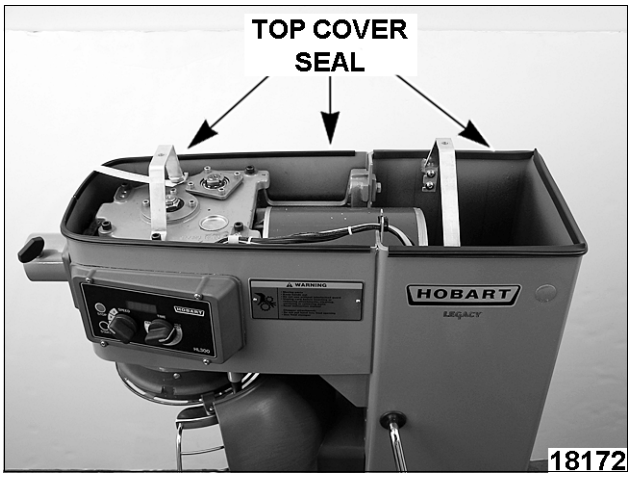


2. Raise top cover and remove.



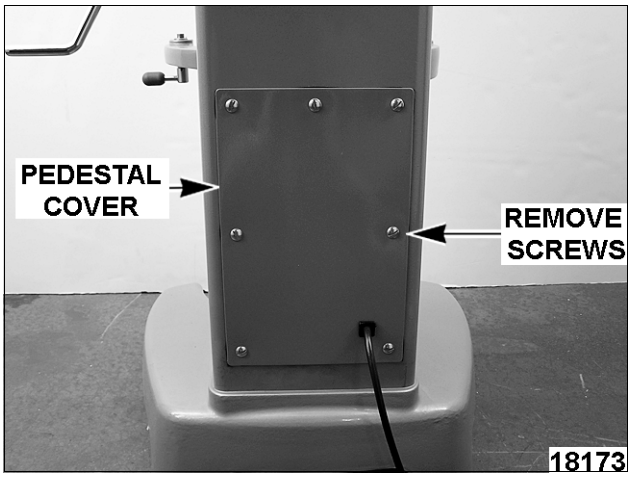
3. Reassemble in reverse order.

NOTE: When re-assembling top cover to mixer, be sure top cover seal is properly seated on mixer.



PEDESTAL COVER

1. Remove pedestal cover.



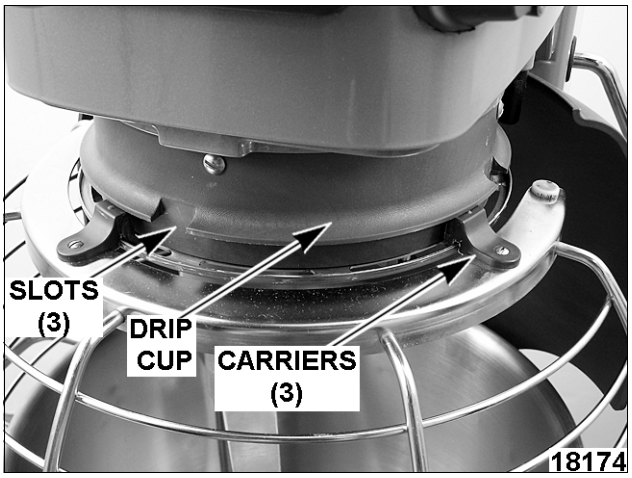
2. Reassemble in reverse order.

BOWL GUARD ASSEMBLY

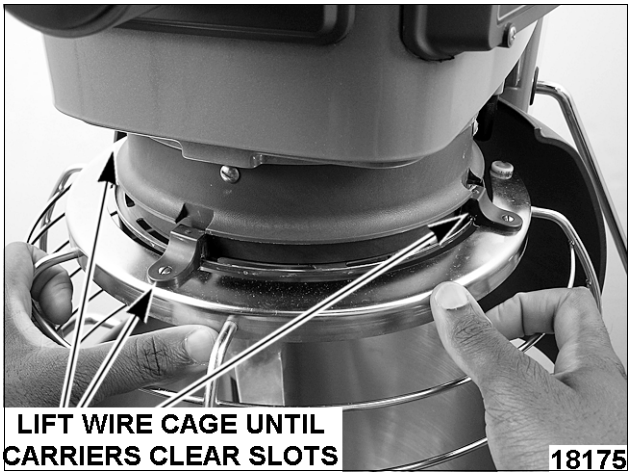
REMOVAL AND REPLACEMENT

WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

1. Rotate wire cage until the three carriers align with slots in drip cup.



   A. Lift wire cage until carriers clear the slots and remove cage.



2. Lower bowl support and remove agitator.
3. Remove drip cup.

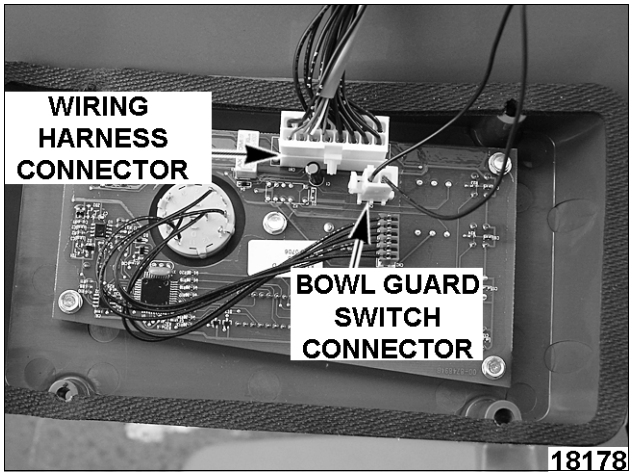
4. Reassemble in reverse order and check for proper operation.

BOWL GUARD SWITCH - 1LS

WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

1. Remove TOP COVER.
2. Remove screws securing timer control assembly to wrap.
   A. Remove timer control assembly from wrap.
   B. Support timer control assembly.

3. Note connection points of bowl guard switch connector and wiring harness connector. Disconnect both connectors.



4. Pull bowl guard switch by the lead wires to remove from switch holder.

NOTE: Bowl guard switch is inserted into switch holder and held in place with a light application of RTV.

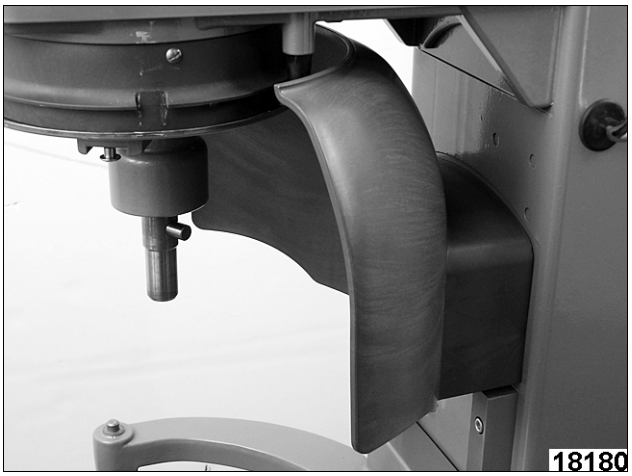
5. To install:
   A. Check switch holder for loose debris in the bottom and remove debris.
   B. Insert bowl guard switch into switch holder. Ensure the switch is fully inserted.
   C. Apply a bead of RTV 732 at the top of bowl guard switch to secure the switch to the switch holder.
6. Connect bowl guard switch to timer control board.
7. Re-connect wiring harness connector.
8. Reinstall timer control assembly.
9. Reinstall drip cup, wire cage, bowl and top cover.
10. Raise bowl into mix position.
11. Check unit for proper operation.

BOWL SWITCH - 2LS

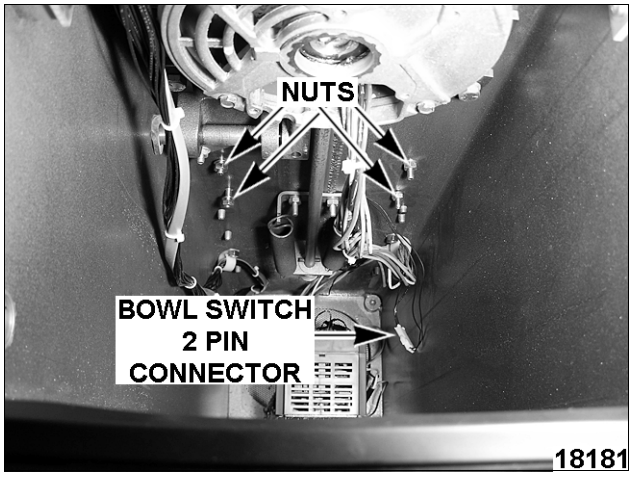
REMOVAL

WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

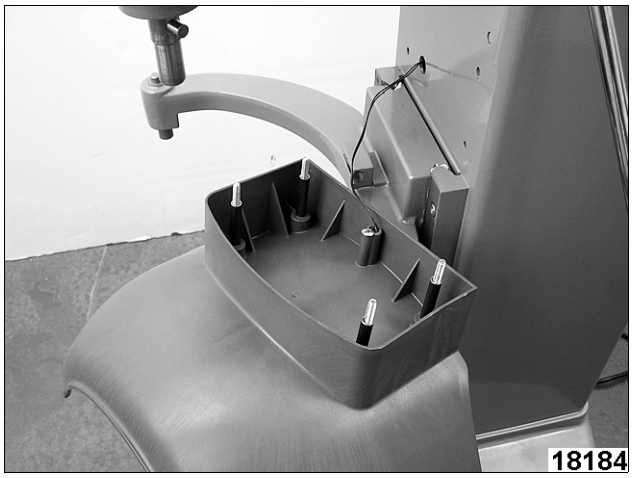
1. Lower bowl and remove.
2. Remove wire cage and beater.



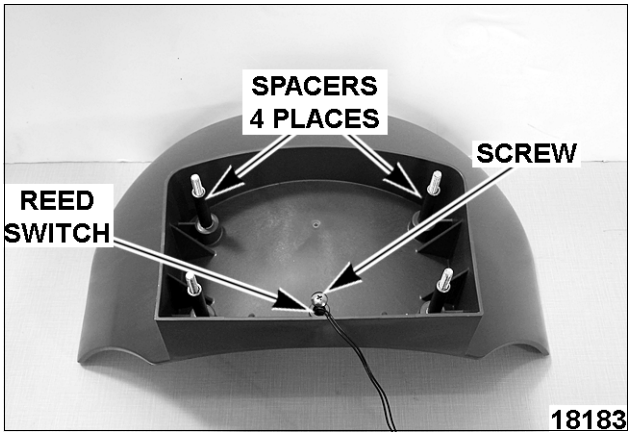
3. Disconnect bowl switch at 2 pin connector.
4. Remove nuts from mixer pedestal.



5. Remove splash guard from mixer.



6. Remove screws securing bowl switch to splash cover.
7. Remove bowl switch.



INSTALLATION

NOTE: When reinstalling splash cover to mixer, make sure spacers are in place.

1. Reassemble in reverse order.
2. Check mixer for proper operation.

TIMER BOARD

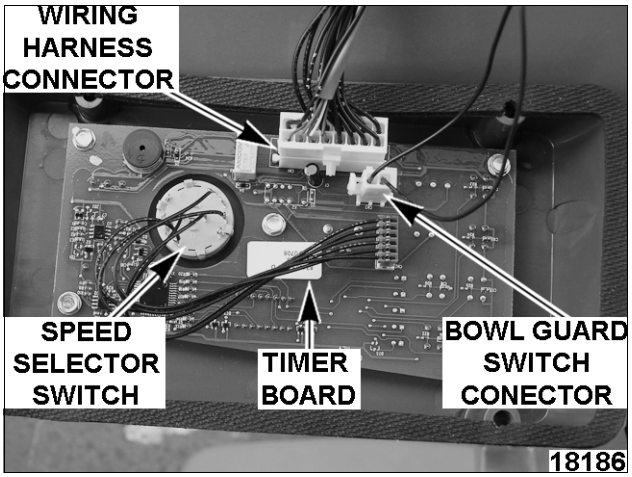
WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

CAUTION: Certain components in this system are subject to damage by electrostatic discharge during field repairs. A field service grounding kit is available to prevent damage. The field service grounding kit must be used anytime the control board is handled.

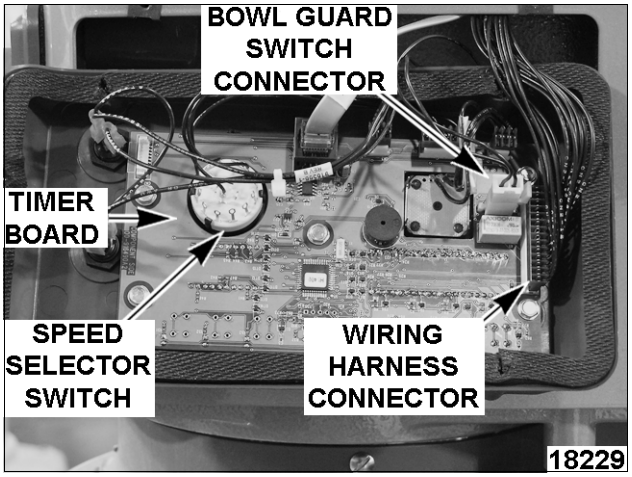
1. Remove TOP COVER.
2. Loosen set screws then pull knobs from shaft.
3. Remove mounting nut and lock washer from speed selector shaft.
4. Remove screws securing timer control assembly to wrap.

5. Disconnect wiring harness connector, speed selector switch and bowl guard switch connector from timer board.

NOTE: HL300 timer board shown.



NOTE: HL400 timer board shown.



6. Remove timer board.
7. Reassemble in reverse order.

SPEED SELECTOR SWITCH

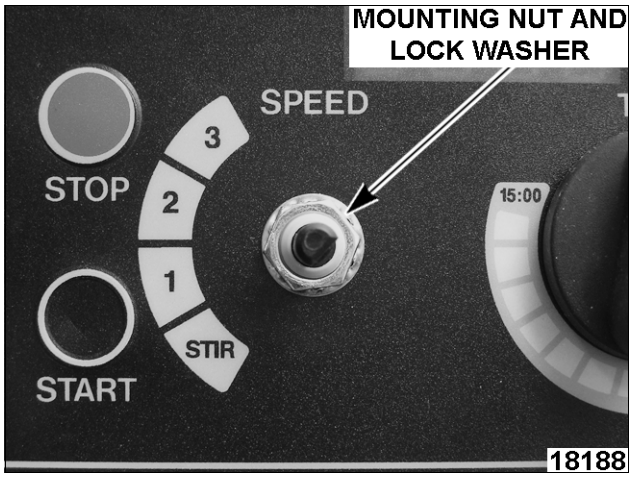
WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

CAUTION: Certain components in this system are subject to damage by electrostatic discharge during field repairs. A field service grounding kit is available to prevent damage. The field service grounding kit must be used anytime the control board is handled.

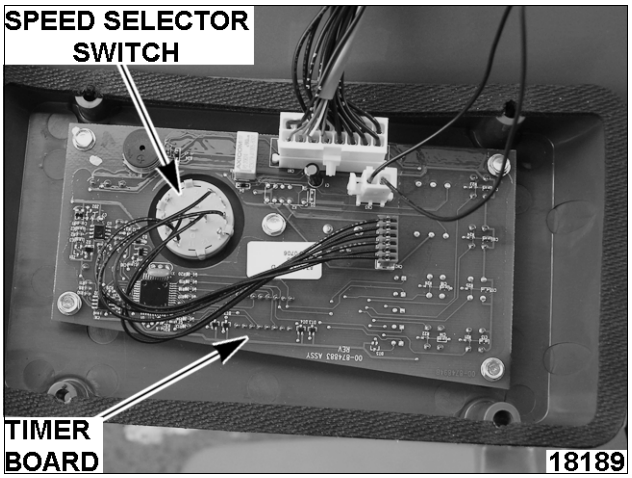
REMOVAL AND REPLACEMENT

1. Loosen set screw then pull knob from shaft.

2. Remove mounting nut and lock washer.



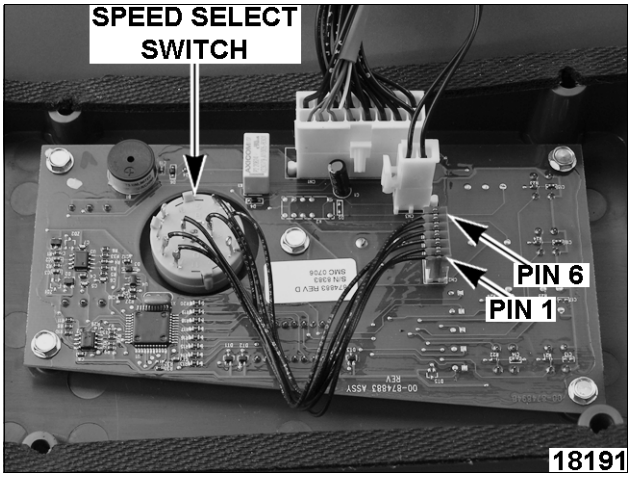
3. Remove screws securing timer control assembly to wrap.
4. Disconnect speed selector switch connector from timer board.



5. Reassemble in reverse order and check for proper operation.

SPEED SELECT SWITCH TEST HL300

NOTE: This test will check the speed selector switch.



1. Remove CONTROL PANEL.
2. Disconnect speed select switch wiring from timer board.
3. Set meter to measure continuity or resistance (Ω).

A. Check continuity between pin 6 (wiper) and pins 1 thru 4.

Speed	Pin 1 to 6	Pin 2 to 6	Pin 3 to 6	Pin 4 to 6
Stir	Open	Open	Open	Open
1	Closed	Closed	Open	Open
2	Open	Open	Closed	Closed
3	Closed	Closed	Closed	Closed

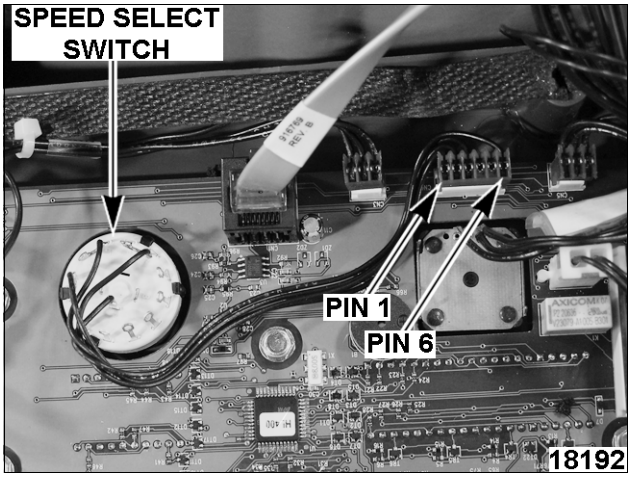
1) If readings agree then the speed selector switch is functioning properly.

2) If readings do not agree then check the speed selector switch, wiring harness connections and terminal connections at the motor drive.

SPEED SELECT SWITCH TEST HL400

NOTE: This test will check the speed selector switch.

1. Remove CONTROL PANEL.



2. Disconnect speed select switch wiring from timer board.
3. Set meter to measure continuity or resistance (Ω).
   A. Check continuity between pin 6 (wiper) and pins 1 thru 3.

Speed	Pin 1 to 6	Pin 2 to 6	Pin 3 to 6
Stir	Open	Open	Closed
1	Closed	Open	Closed
2	Open	Closed	Closed
3	Closed	Closed	Closed

B. If readings agree then the speed selector switch is functioning properly.

C. If readings do not agree then check the speed selector switch, wiring harness connections and terminal connections at the motor drive.

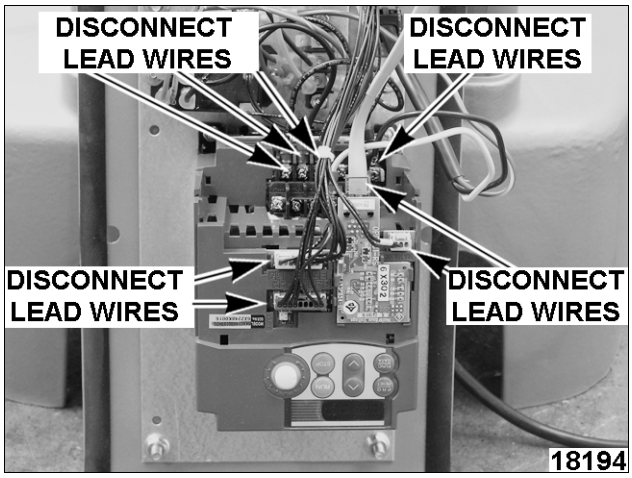
MOTOR DRIVE

WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

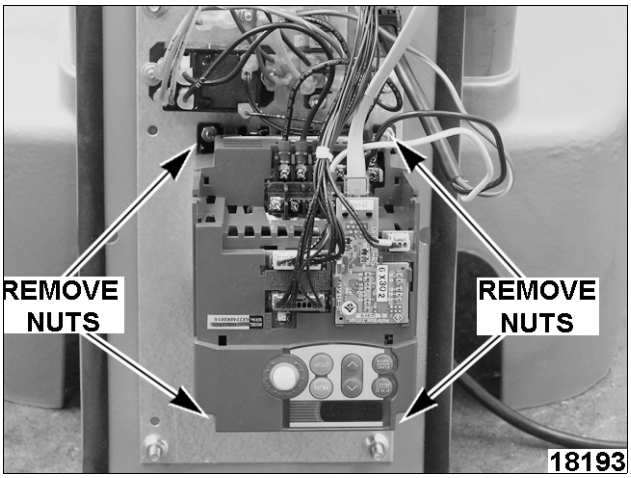
CAUTION: Certain components in this system are subject to damage by electrostatic discharge during field repairs. A field service grounding kit is available to prevent damage. The field service grounding kit must be used anytime the control board is handled.

REMOVAL AND REPLACEMENT

1. Remove PEDESTAL COVER.
2. Perform BUS VOLTAGE BLEED DOWN.
3. Disconnect lead wires from motor drive.



4. Remove nuts securing motor drive to mounting plate.



NOTE: Refer to MOTOR DRIVE TORQUE VALUES for proper tightening of terminal screws.

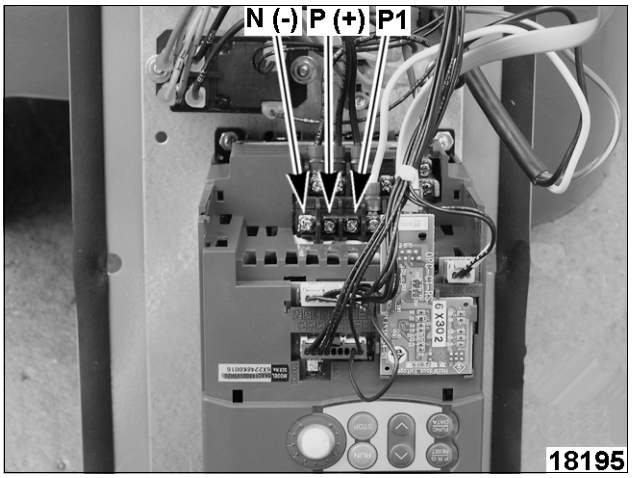
5. Reassemble in reverse order and check for proper operation.

BUS VOLTAGE BLEED DOWN

WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

WARNING: WAIT ONE MINUTE FOR THE CAPACITIVE BUS VOLTAGE TO BLEED DOWN.

1. Remove PEDESTAL COVER.
2. Set DMM to DC voltage.



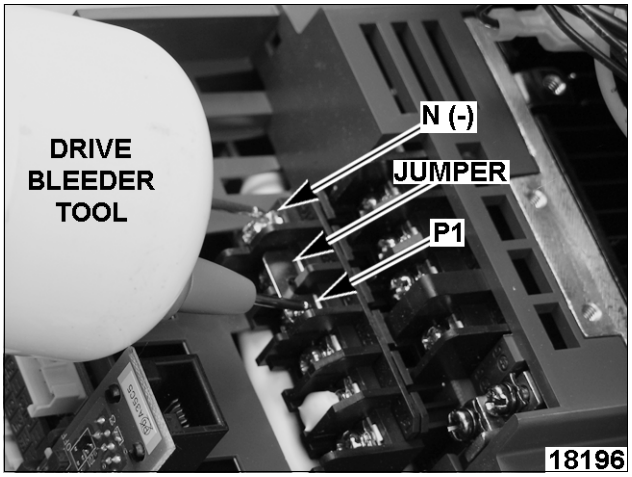
A. Measure bus voltage across P (+) & N (-) terminals on motor drive to ensure the voltage is below 50VDC.

B. If bus voltage is higher than 50VDC:

1) Verify jumper is in place between terminals P (+) and P1 on motor drive.

NOTE: Terminal spacing on motor drive does not permit the drive bleeder tool to connect with terminals P (+) & N (-) for bleed down. However, with the jumper connecting P (+) and P1 the same voltage potential exists at both terminals.

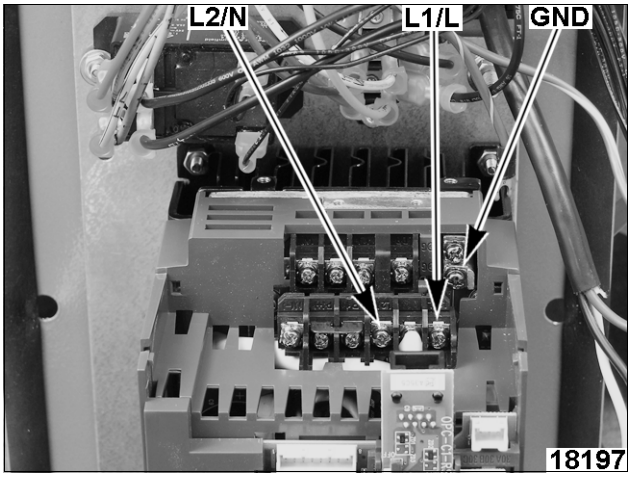
2) Place drive bleeder tool across the jumper at P1 & N (-) terminal for at least one minute to discharge the bus circuit.



3. Remove drive bleeder tool.
4. Recheck bus voltage with meter. If necessary, bleed bus circuit until voltage is below 50 VDC.

BUS VOLTAGE TEST

1. Remove PEDESTAL COVER.
2. Verify input voltage to motor drive at terminals L1/L & L2/N. Check data plate for correct voltage.



A. If not correct, see TROUBLESHOOTING.

B. If correct, proceed to next step.

3. Perform BUS VOLTAGE BLEED DOWN.
4. Set DMM to DC voltage.

A. Connect BLK meter lead on N (-) and RED meter lead on P (+) terminals of motor drive.

5. Connect power.

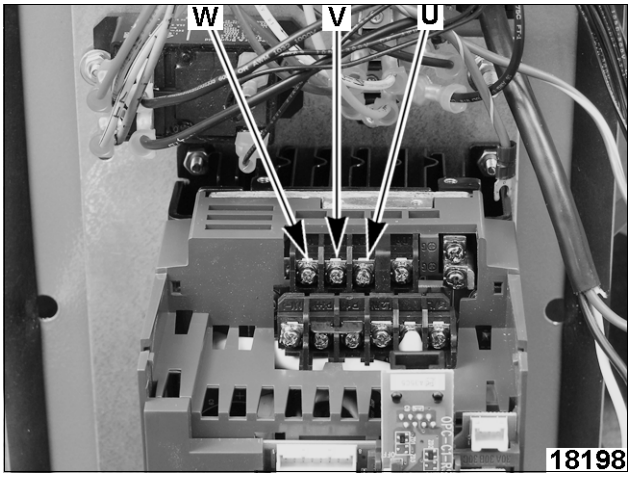
A. The DC voltage reading of the meter should be approximately 340VDC. The acceptable DC bus voltage range is 256VDC to 372VDC.

6. Start mixer in Stir (lowest speed) with no load in bowl.

A. Repeat procedure operating the mixer in each speed with no load in bowl.

MOTOR DRIVE INTERNAL RESISTANCE TEST

1. Perform BUS VOLTAGE BLEED DOWN.
2. Disconnect lead wires from motor drive terminals U, V & W.
3. Measure resistance (ohms) between motor drive terminals U, V & W.



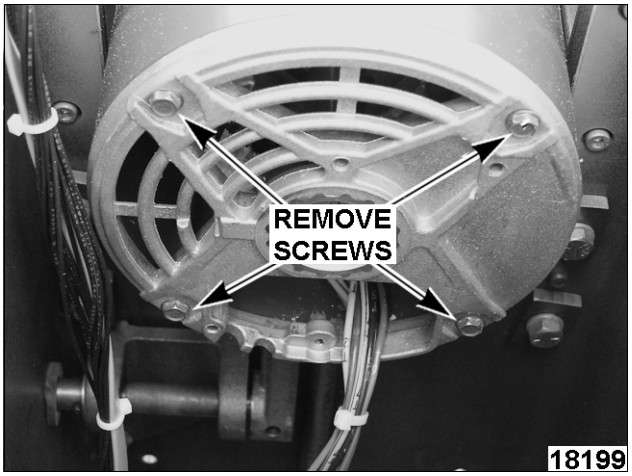
A. If resistance measured is below 1 $M\Omega$, replace motor drive.

MOTOR

WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

REMOVAL AND REPLACEMENT

1. Remove TOP COVER and PEDESTAL COVER.
2. Disconnect motor lead wires T1 thru T9.
3. Remove motor mounting screws.

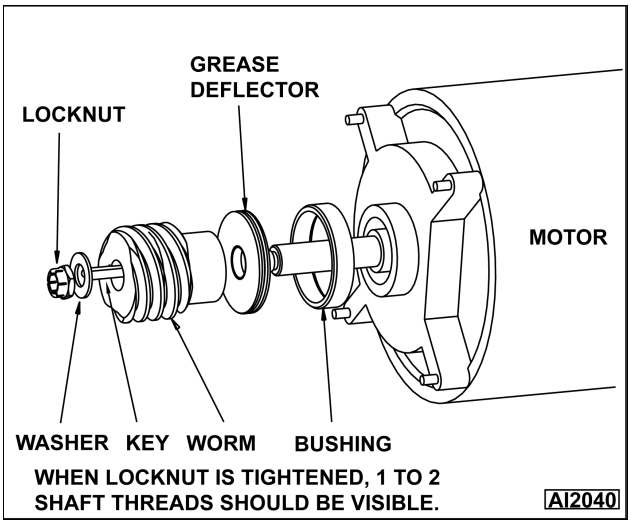


4. Pull motor from transmission case.

   A. Remove locknut from motor shaft then remove the worm gear assembly parts.

5. To Install:

   A. Install worm gear assembly parts onto motor shaft and secure with locknut.



   B. Coat worm gear with Mobilith AW-2 grease.

   C. Position motor with lead wires down and install motor to transmission case. Tighten motor mounting screws in an alternating pattern to 24-30 in*lb of torque.

   D. Turn motor shaft manually (opposite drive end) to ensure it rotates freely.

6. Connect motor lead wires.
7. Check for proper operation.

MOTOR CURRENT

NOTE: Because of the nature of electronic motor drive technology (variable switching frequencies), accurate output voltage measurements from the motor drive to the motor cannot be made with a standard DMM or analog VOM.

NOTE: Motor current draw is not the same as the line service current draw of the mixer.

For checking current draw of each phase of the motor, use a clamp-on ammeter.

1. Press stop.
2. Remove PEDESTAL COVER.
3. Select the speed setting of Stir and press start.
4. Measure current on each phase of the motor lead wires. Use the motor wiring table to identify motor lead wires.

MOTOR WIRING	
Motor Lead Wires Marked	**Motor Drive Terminals**
T1	U (thru 1CR 8/6)
T2	V (thru 1CR 4/2)
T3	W (1MTR to terminal)

5. Repeat procedure for all mixer speeds.
   A. Current may vary between phases but should be balanced. If current draw on any phase is 5% higher or lower than the other phases, verify that the motor drive is properly wired.
      1) If wiring is correct, check motor winding resistance.
      2) If motor checks ok, replace motor drive.

MOTOR WINDING RESISTANCE

If unable to check current draw using the motor current test and the motor is suspect, check the motor winding resistance.

1. Perform BUS VOLTAGE BLEED DOWN.
2. Disconnect motor lead wires:
   A. T1 & T2 from 1CR at terminals 2 & 6.
   B. T3 from motor drive terminal W.
3. Measure resistance (ohms) between all three motor leads. Use the motor wiring table to identify motor lead wires.

Motor Lead Wires	Resistance (Ohms)*
T1-T2	3.40
T1-T3	3.40
T2-T3	3.40
* Resistance values at 77°F room ambient. Tolerance is ±15%.	

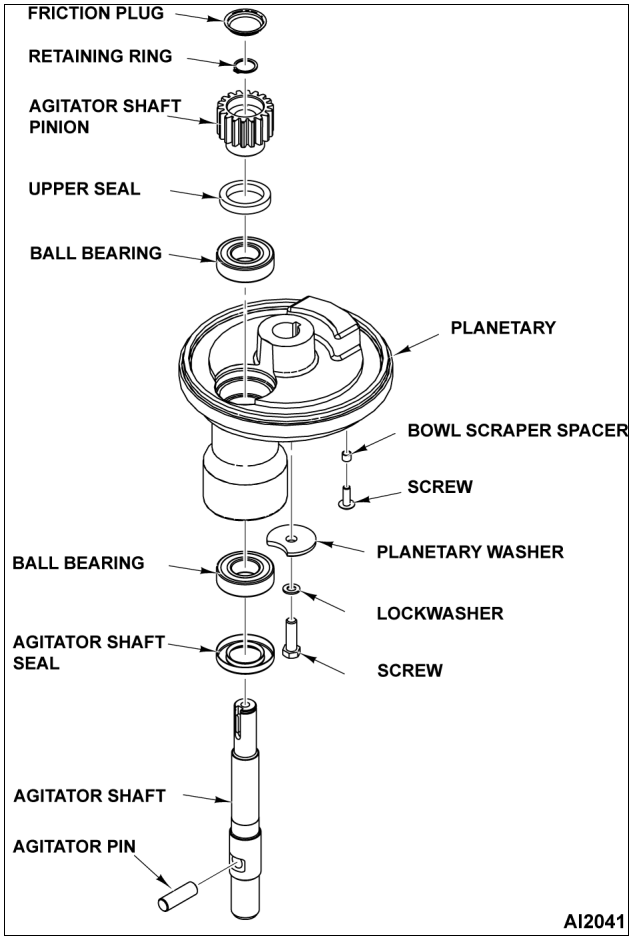
   A. If resistance is out of tolerance for the room ambient temperature, replace motor.
4. Measure resistance between motor leads and unpainted motor frame surface (ground).
   A. If resistance measured is below 500K ohm, replace motor.

PLANETARY

WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

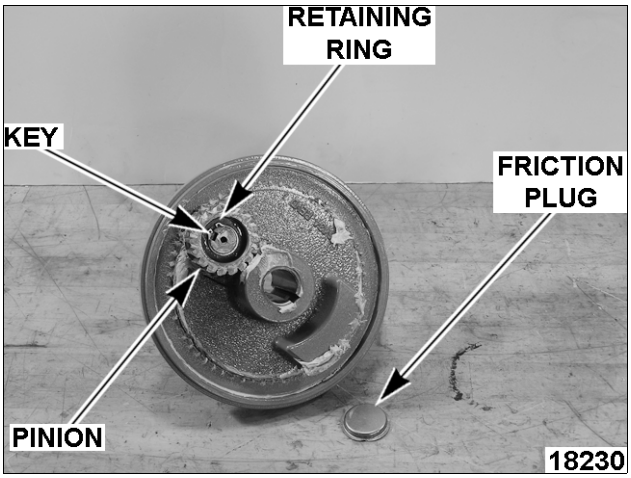
REMOVAL

1. Remove wire cage and drip cup as outlined under BOWL GUARD ASSEMBLY.
2. Remove screw, lock washer and planetary washer.
3. Remove planetary from mixer.



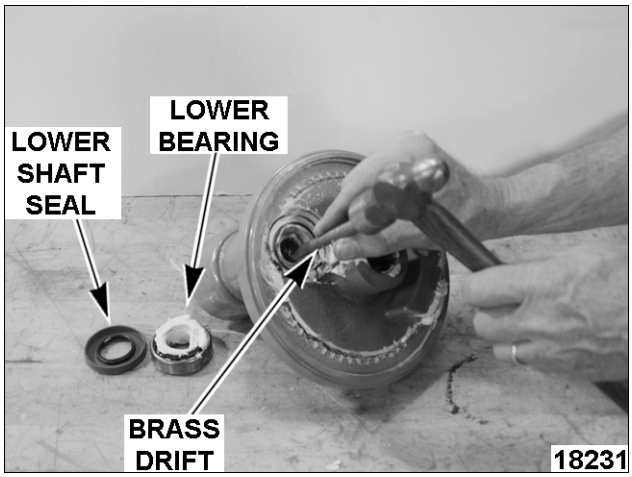
PLANETARY DISASSEMBLY

1. Remove friction plug, retaining ring, agitator shaft pinion, and key from agitator shaft.

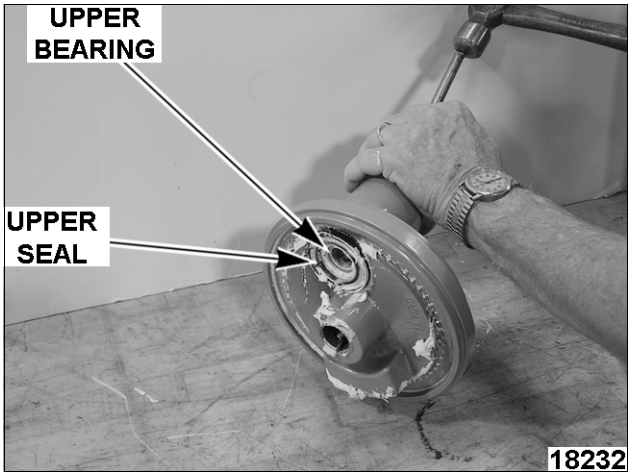


2. Drive agitator shaft, lower ball bearing, and lower seal from planetary.

NOTE: When removing use a brass drift to remove.



3. Drive upper bearing and upper shaft seal from planetary.



ASSEMBLY AND INSTALLATION

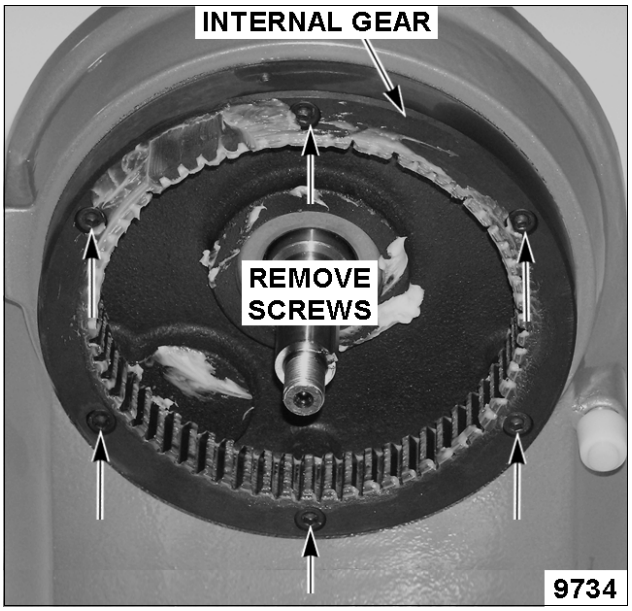
NOTE: Ensure all parts are clean before assembly. Remove old grease from parts being reused.

1. Slide agitator shaft seal and lower ball bearing onto agitator shaft.
2. Press lower bearing onto agitator shaft until inner race of bearing seats against shoulder of agitator shaft.
3. Press agitator shaft with lower bearing seated on the shaft into planetary casting until bearing seats against shoulder inside the casting.
4. Fill planetary casting void 2/3 full with Chevron FM EP-2 grease.
5. Press upper bearing into planetary casting until bearing seats against shoulder inside the casting.
6. Install upper seal into planetary casting until the seal is flush with casting.
7. Insert key and beater pinion onto agitator shaft with shoulder against upper bearing race then secure with friction plug.
8. Coat beater pinion with Chevron FM EP-2 grease.
9. Check for proper operation.

INTERNAL GEAR

WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

1. Remove PLANETARY.
2. Remove internal gear from transmission case.



3. To Install:
   A. Install internal gear with threaded holes for drip cup screws (3) to the front and sides of mixer. Tighten internal gear mounting screws in an alternating pattern to 175-275 in*lb of torque.

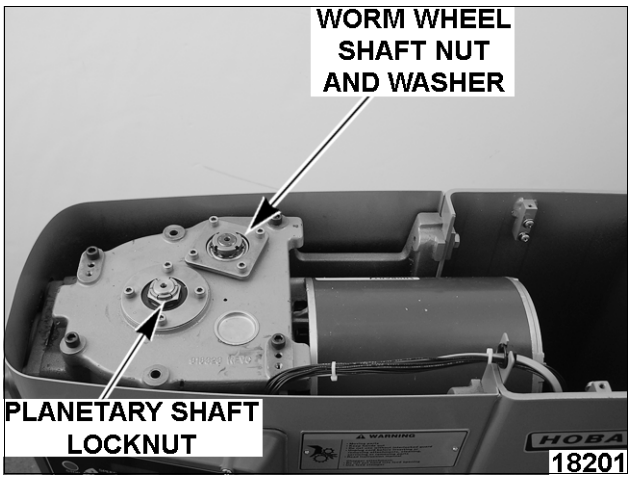
   B. Coat internal gear with Chevron FM EP-2 grease.
4. Install PLANETARY.
5. Check for proper operation.

TRANSMISSION / ATTACHMENT HUB

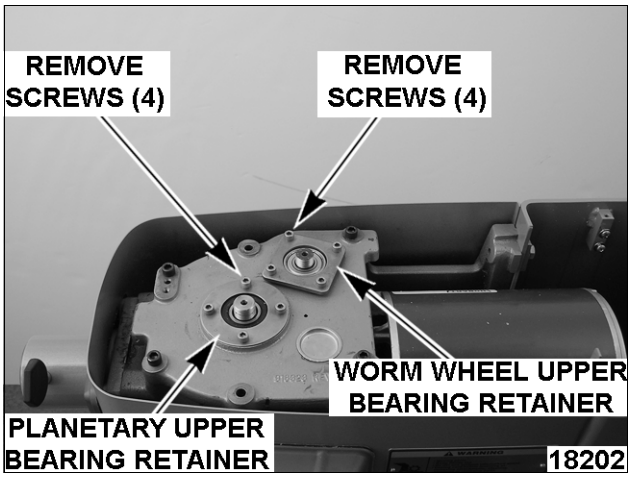
WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

REMOVAL AND DISASSEMBLY

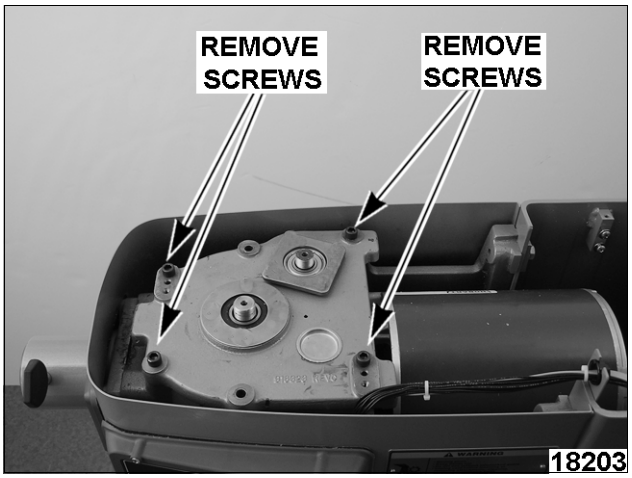
1. Lower bowl support.
2. Remove BOWL GUARD.
3. Remove top cover and front cover strap.
4. Place drive into the service position and ensure capacitive bus voltage is below 50VDC.
5. Perform PLANETARY REMOVAL as outlined in PLANETARY.



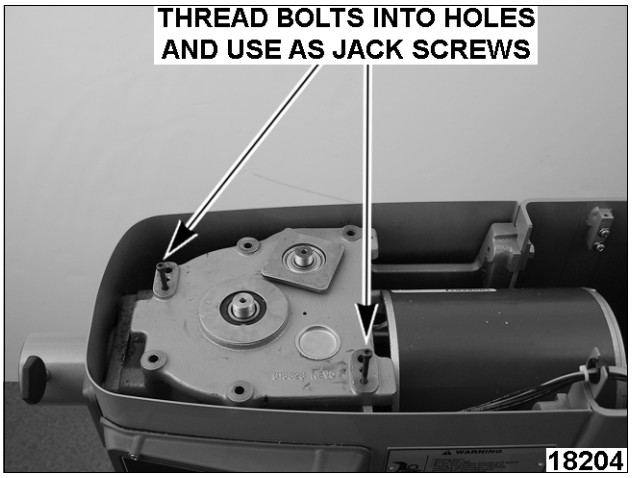
6. Remove planetary upper bearing retainer. Remove worm wheel upper bearing retainer.



7. Remove screws from transmission cover.

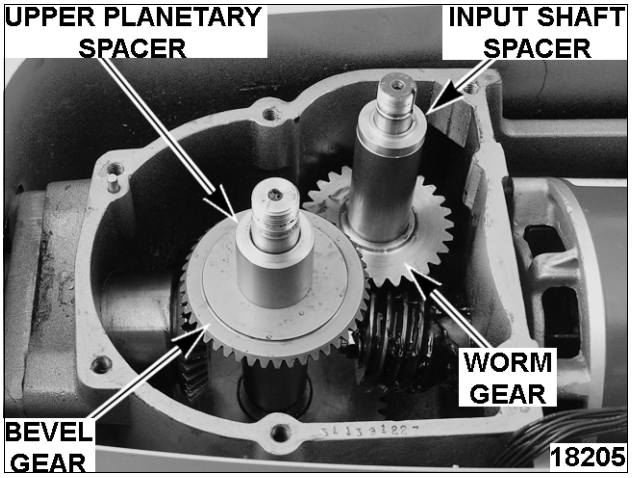


8. To remove transmission cover, use fully threaded (hardened if possible) bolts (2) as jack screws. Turn each bolt 1-2 revolutions and alternate until transmission cover separates from case.

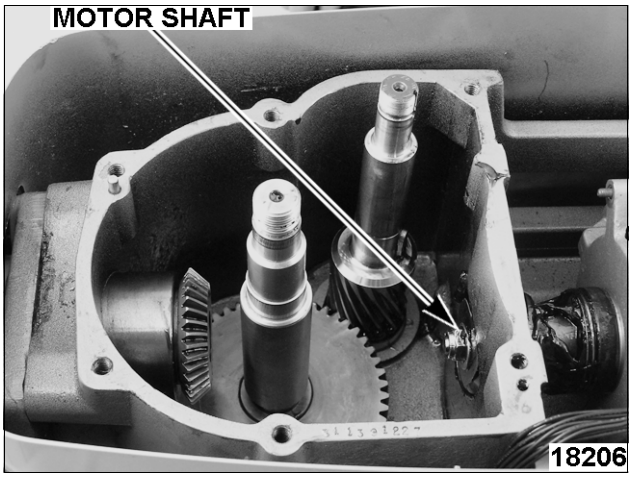


9. Remove upper planetary spacer and input shaft spacer.

10. Remove bevel gear and worm gear.

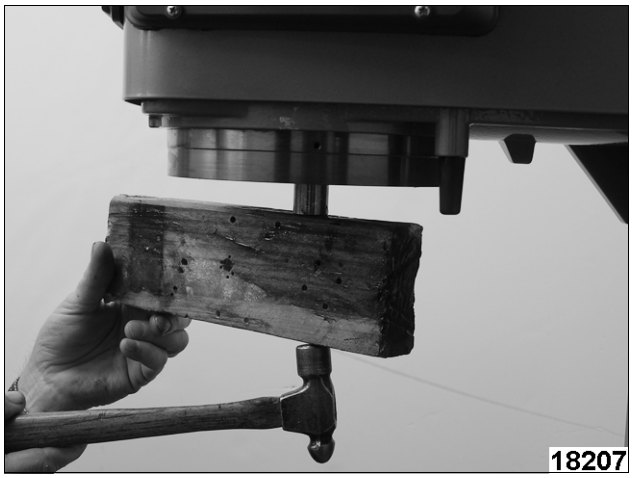


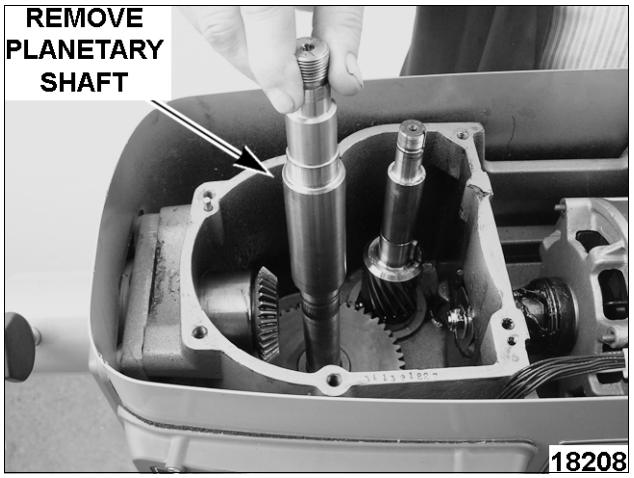
NOTE: In order to remove remaining parts from transmission and attachment hub, it will be necessary to slide motor shaft out of the way.



11. Drive planetary shaft from transmission case and remove.

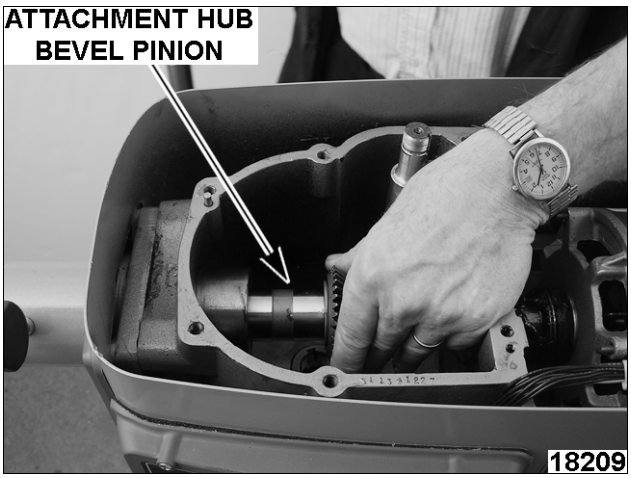
NOTE: Use a block of wood or a soft face/ special hammer when removing planetary shaft.





NOTE: Retain key from planetary shaft for use during transmission assembly.

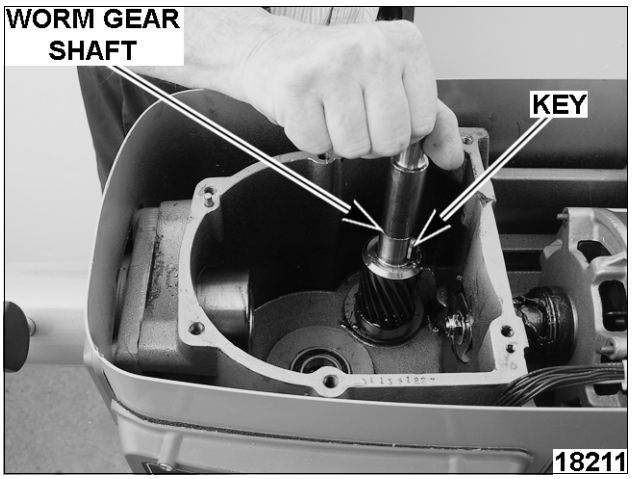
12. Remove bevel pinion from attachment hub.



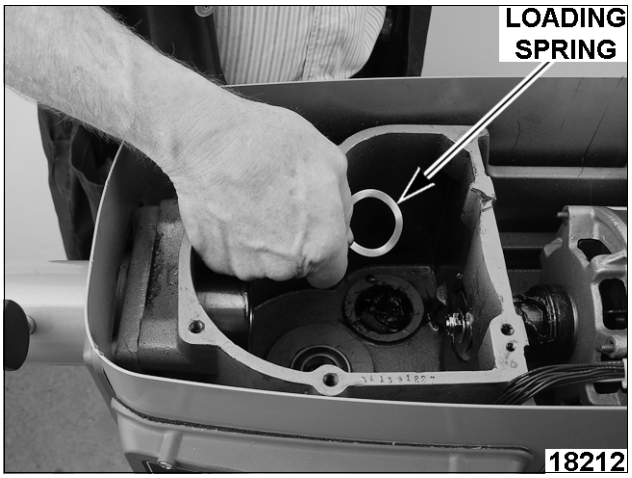
13. Remove helical gear.

14. Remove worm gear shaft.

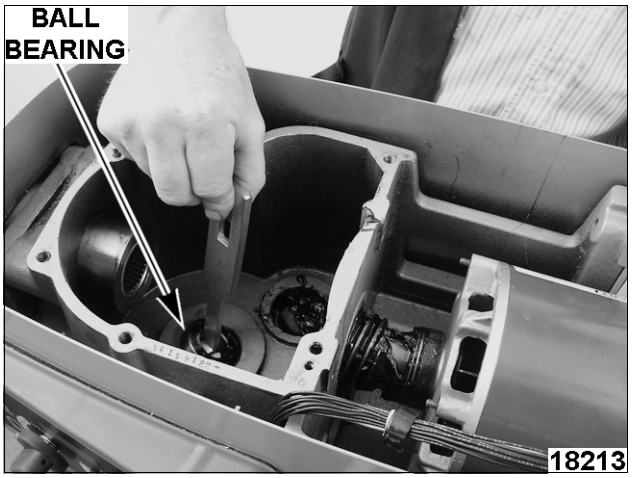
NOTE: Retain key from worm gear shaft for use during transmission assembly.



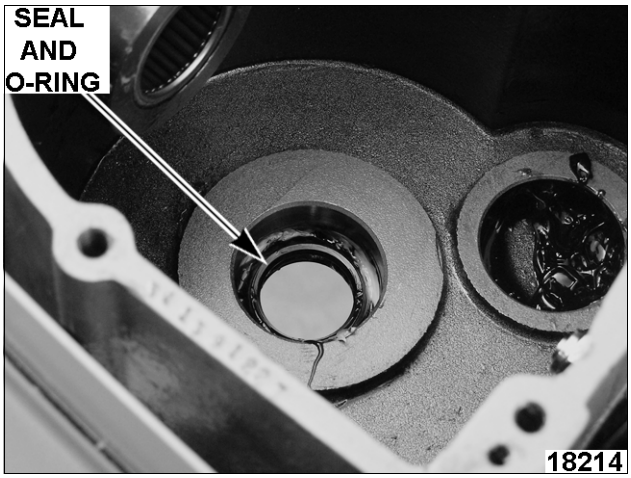
15. Remove loading spring.



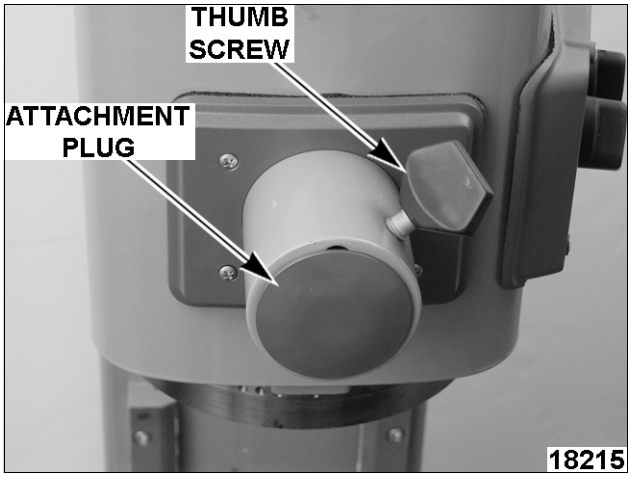
16. Remove ball bearing.



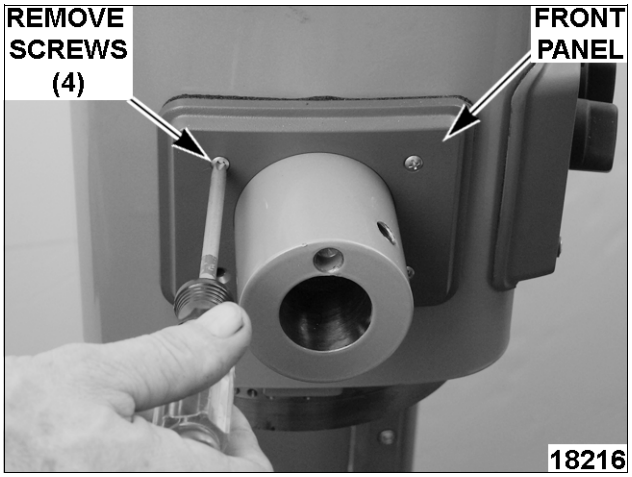
17. Remove planetary seal and ring.



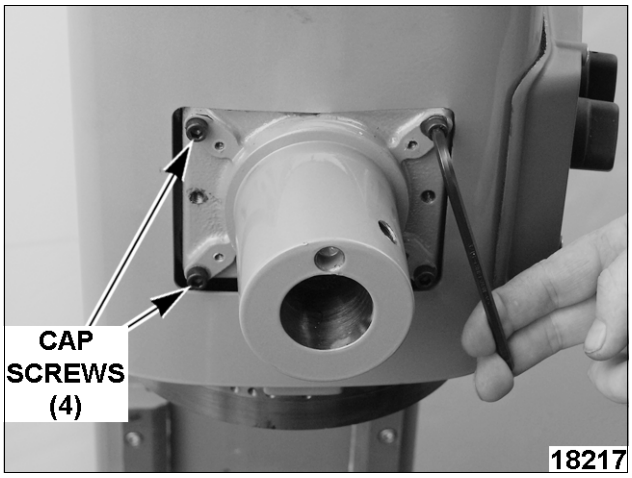
18. Remove thumb screw and attachment plug.



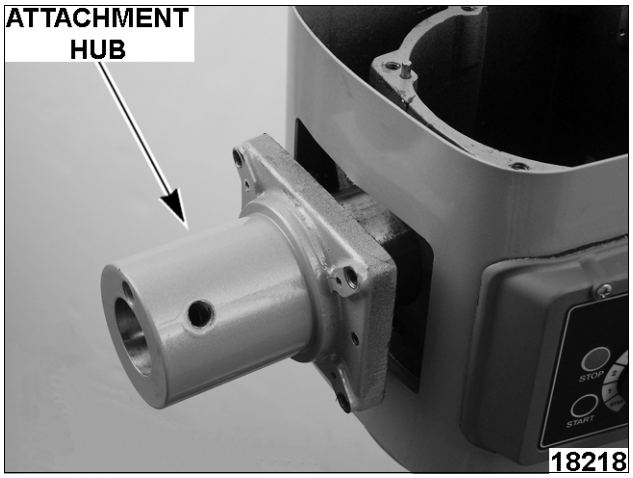
19. Remove screws and front panel.



20. Remove cap screws.



21. Remove attachment hub.



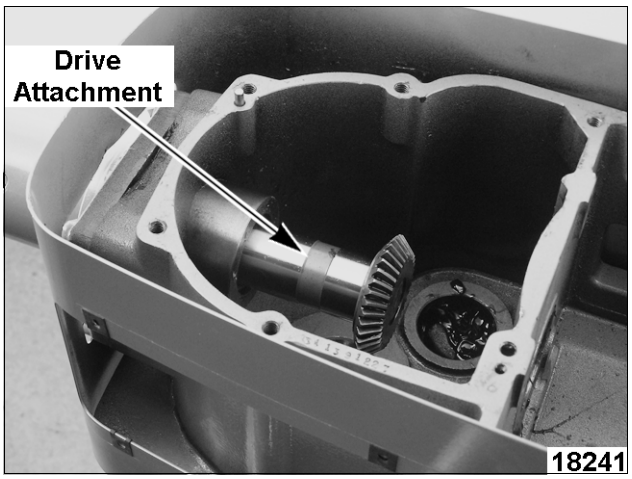
ASSEMBLY AND INSTALLATION

NOTE: Ensure all parts are clean before assembly. Remove old grease from parts being reused.

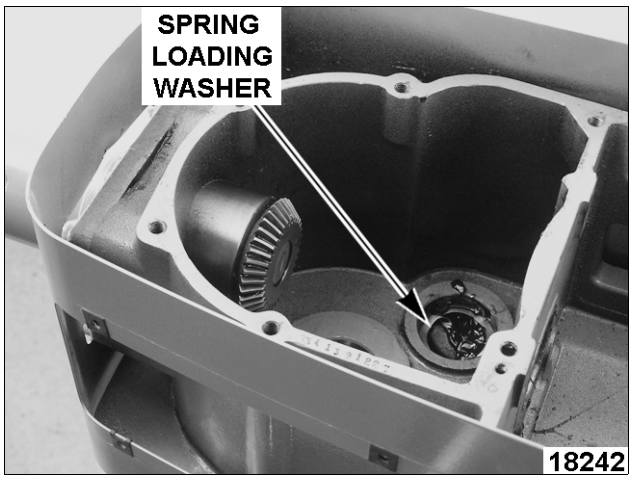
1. Clean sealant from flat and rounded surfaces of attachment hub and transmission case.
2. Coat surface of attachment hub casting with gasket sealer (Permatex #2) before reassembly.
3. Install attachment hub to transmission case.

NOTE: Be certain to install hub with opening towards bottom.

4. Install washer and gear drive attachment.

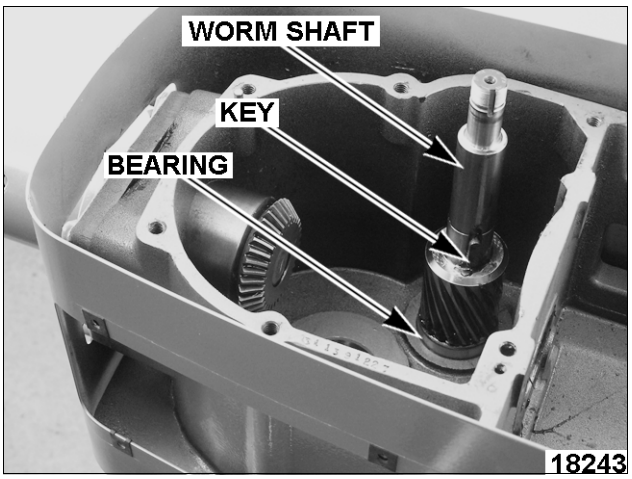


5. Install spring loading washer.

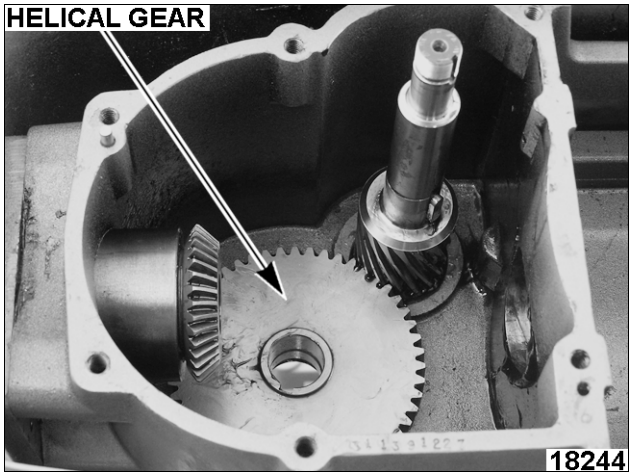


6. Install ball bearing and worm shaft.

NOTE: Be certain to install key onto worm shaft.

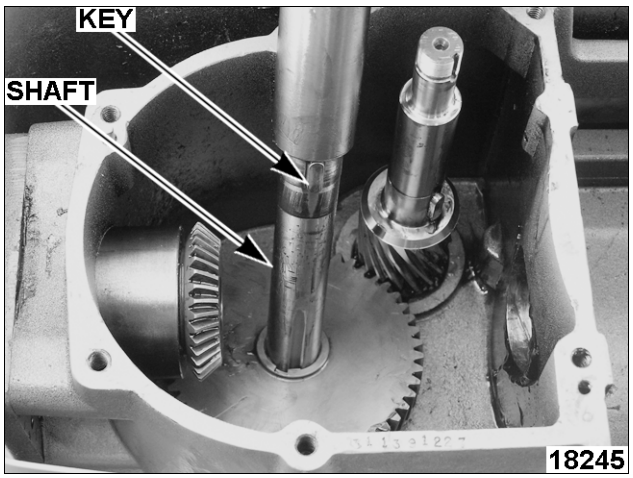


7. Install helical gear.

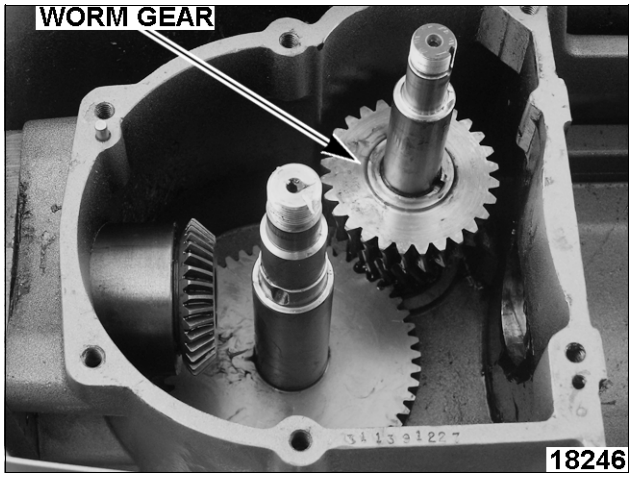


8. Install planetary shaft.

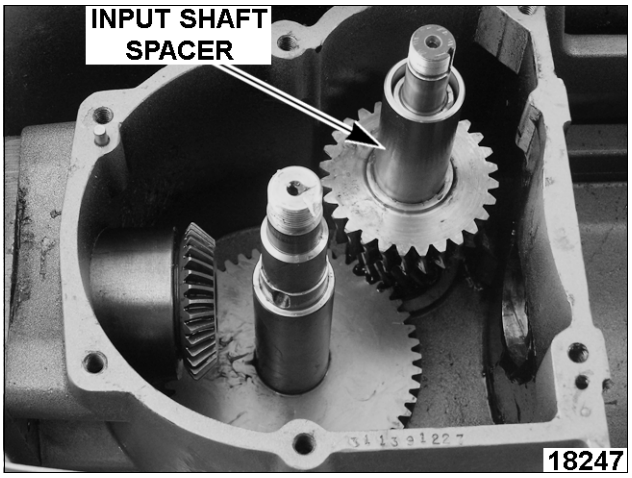
NOTE: Be certain to install key onto planetary shaft.



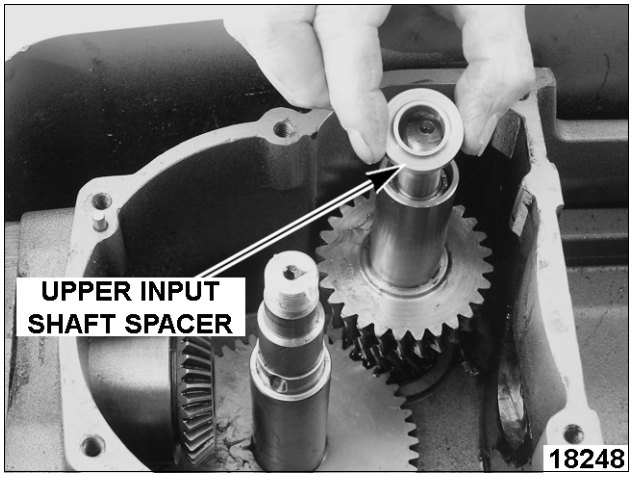
9. Install worm gear on worm gear shaft.



10. Install input shaft spacer on worm gear shaft.

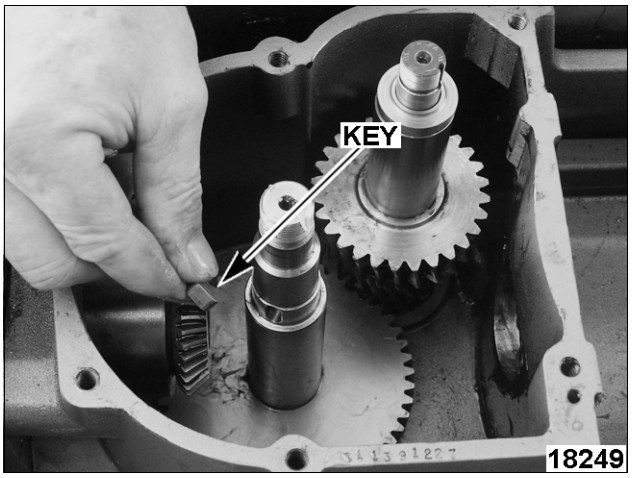


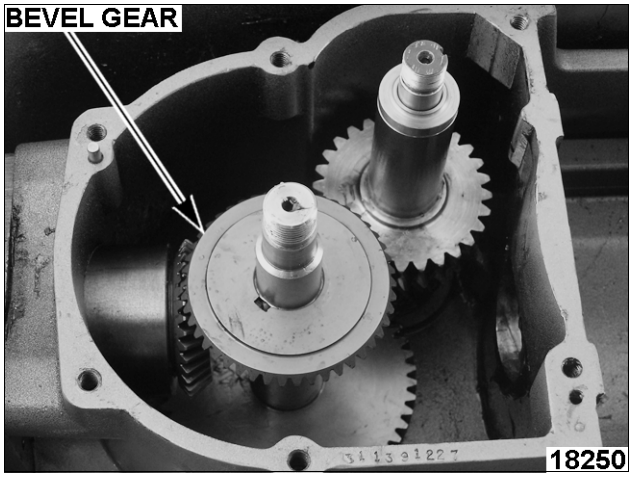
11. Install upper input shaft spacer.



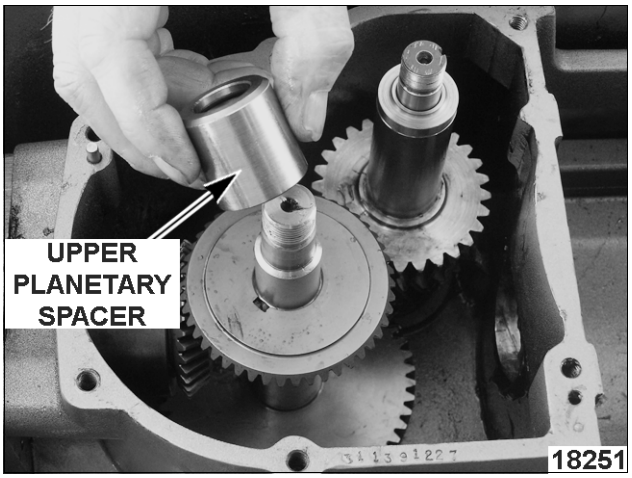
12. Install bevel gear onto planetary shaft.

NOTE: Be certain key is in place on planetary shaft.



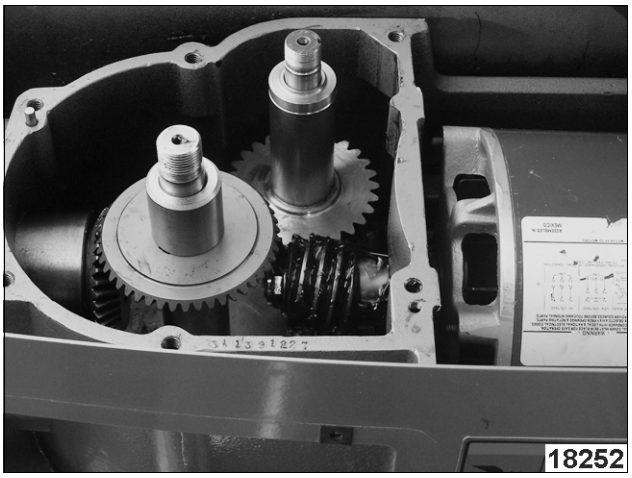


13. Install upper planetary spacer.



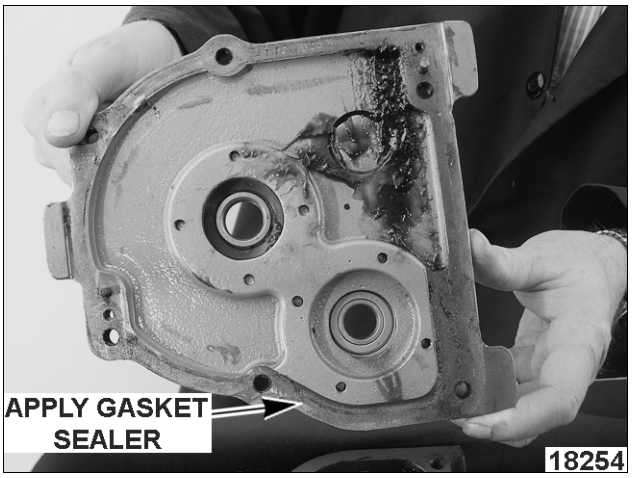
14. Install motor to transmission case.

NOTE: Position motor with lead wires down. Tighten motor mounting screws in an alternating pattern to 24-30 in*lb of torque.



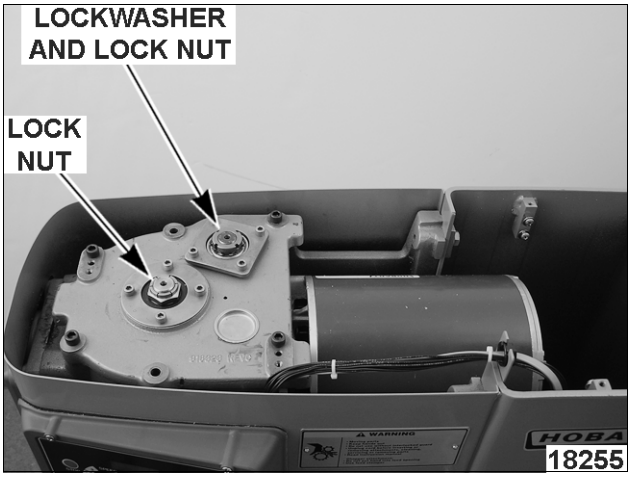
15. Add 40 oz. Of Mobilith AW-2 grease to transmission case. Coat all gears throughly with grease.

16. Clean and dry the mating surfaces of the transmission case and the transmission cover.
17. Apply gasket sealer (Permatex #2) to the perimeter of the transmission cover.



18. Install cover onto transmission case. Tighten screws in an alternating pattern to 175-275 in*lb of torque.

19. Install lock nut on planetary shaft.
20. Install lock washer and lock nut on worm gear shaft.

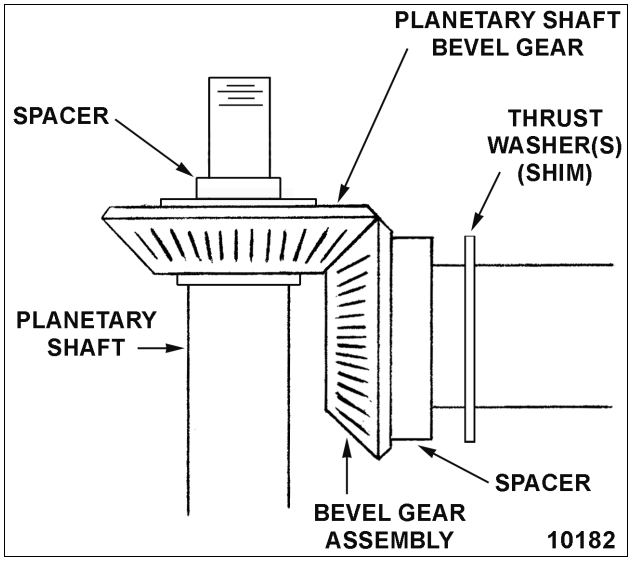


21. Install front cover mounting strap and tighten two screws to 175-275 in*lb.
22. Install PLANETARY.

BEVEL GEARS MESHING ADJUSTMENT

WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

NOTE: For proper gear meshing, the teeth between the bevel gear assembly (attachment hub) and the planetary shaft bevel gear should engage with a clearance of .005" to .020" and be aligned as shown below.



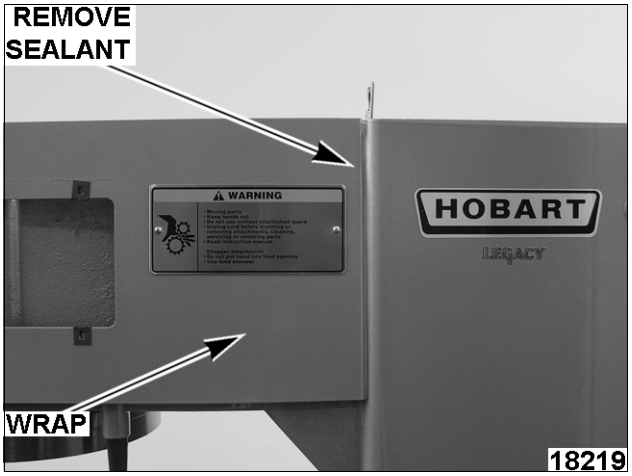
1. Remove attachment hub plug.
2. To determine if clearance is within tolerance, use bevel gear assembly movement as an indicator. Push on the bevel gear assembly while checking for movement (.005" to .020").
3. If movement is out of tolerance then access the bevel gears as outlined under TRANSMISSION / ATTACHMENT HUB.
    A. Inspect bevel gear teeth for wear; and bevel gear alignment.
        1) If the gear teeth are excessively worn or damaged, install replacement bevel gears and check clearance and alignment.
            a. If ok, reassemble and check for proper operation.
        2) If the gears are not worn or damaged, continue with procedure.
4. To adjust clearance:
    A. Remove the bevel gear assembly and add or remove thrush washer(s) behind the spacer until clearance is within tolerance.
5. Reassemble as outlined under TRANSMISSION / ATTACHMENT HUB.

WRAP

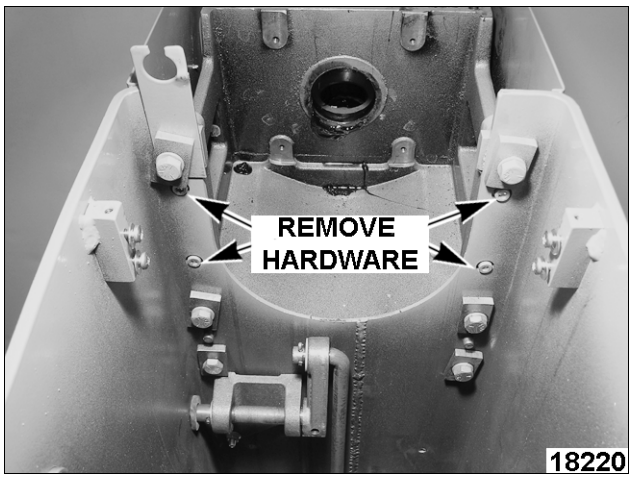
Removal Replacement

WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

1. Remove top cover.
2. Remove timer control assembly.
3. Remove attachment hub and motor.
4. To prevent paint damage to column, cut through sealant with a sharp knife near column.



5. Remove hardware securing wrap to transmission case.

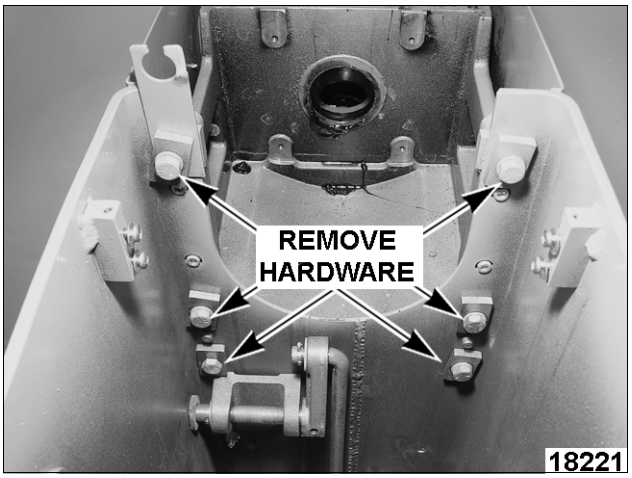


6. Remove wrap.
7. Clean old sealant from column.
   A. Clean wrap if it is to be reused.
8. Install wrap onto column and secure with hardware.
9. Fill seam between wrap and column with aluminum colored RTV-732.
10. Reinstall remaining components that were removed to access wrap.
11. Check for proper operation.

TRANSMISSION CASE

WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

1. Remove top cover.
2. Remove control panel.
3. Remove bowl guard cage, bowl, agitator, and back splash guard.
4. Remove motor.
5. Remove TRANSMISSION / ATTACHMENT HUB.
6. Remove WRAP.
7. Support transmission case.
8. Remove hardware securing transmission case to pedestal.

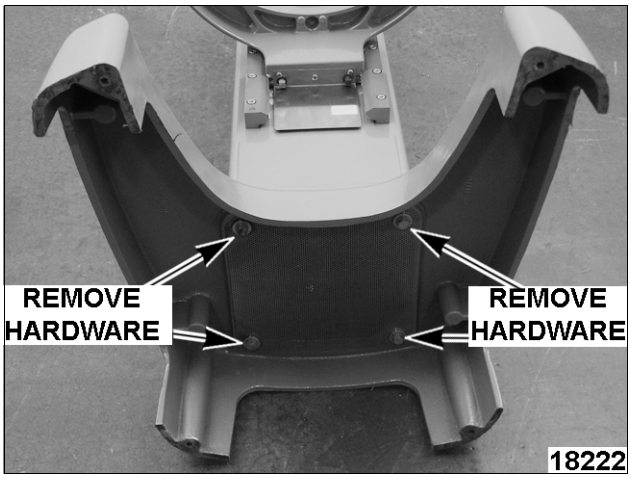


9. Remove transmission case from pedestal.
10. Reassemble in reverse order.
11. Check for proper operation.

BASE

WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

1. Remove PEDESTAL COVER.
2. Perform BUS VOLTAGE BLEED DOWN.
3. Disconnect input voltage lead wires from motor drive terminals L1/L, L2/N and GND.
4. At the joint between base and pedestal, cut through paint with a sharp knife to prevent paint damage.
5. Position mixer to gain access to mounting hardware.
6. Remove hardware.

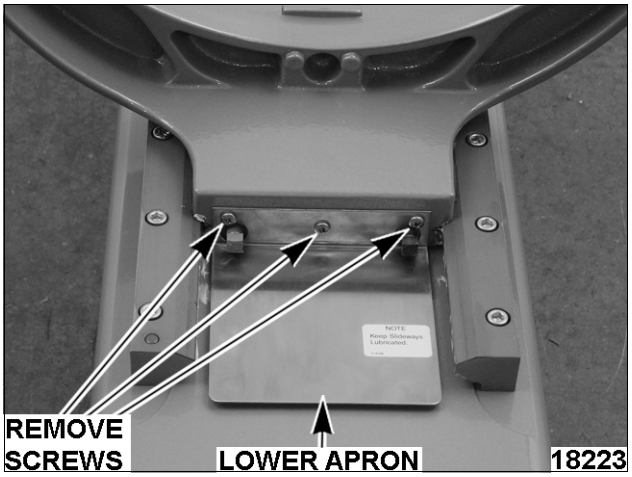


7. Remove base from pedestal.
8. Reassemble in reverse order. Tighten bolts in an alternating pattern to 900-1100 in*lb of torque.
9. Check for proper operation.

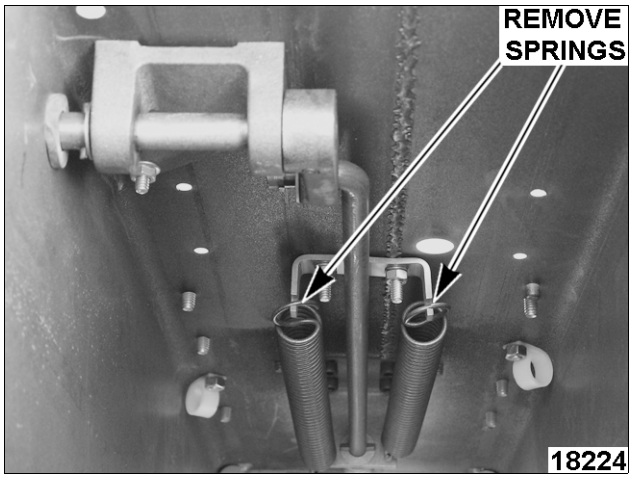
BOWL SUPPORT

WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

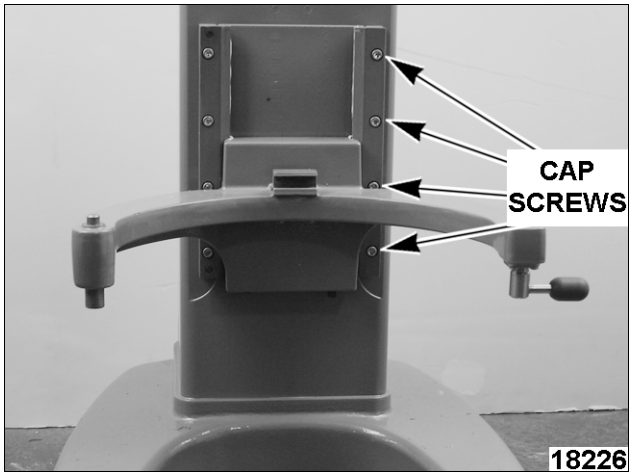
1. Remove PEDESTAL COVER.
2. Remove bowl guard, bowl, agitator and back splash guard.
3. Place bowl lift handle in up position.
4. Remove LOWER APRON.



5. Remove bowl lift springs.

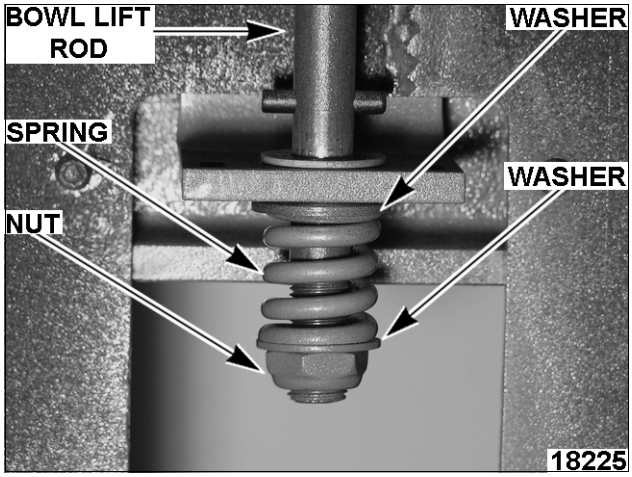


6. Lower bowl lift handle.
7. Remove mounting screws from right side slideway.



NOTE: If paint fills the joint between the slideway and pedestal, cut through paint at the joint with a sharp knife to prevent paint damage.

8. Remove stop nut, spring, and washers from bowl lift rod.



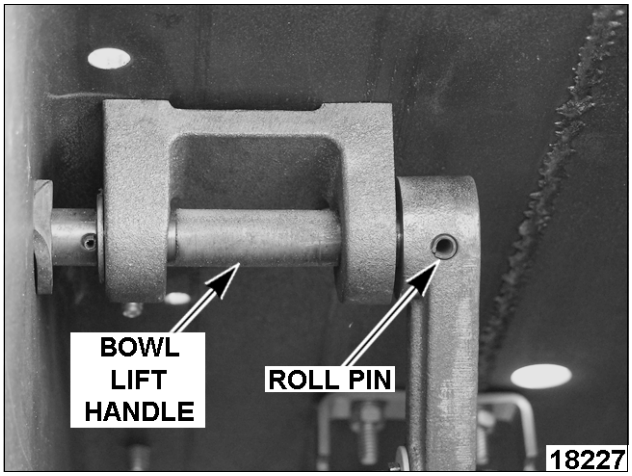
9. Remove right side slideway then remove bowl support.
10. Remove old grease from slideways and mating surfaces of bowl support.
11. Apply light coat of Lubriplate 630-AA to mating surfaces of slideways.
12. Reassemble in reverse order. Tighten slideway mounting screws to 175-275 in*lb of torque.
13. Perform BOWL LIFT HANDLE ADJUSTMENT as outlined under SERVICE PROCEDURES AND ADJUSTMENTS.

BOWL LIFT ASSEMBLY

WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

REMOVAL AND REPLACEMENT

1. Remove bowl guard, bowl, agitator and back splash guard.
2. Remove TOP COVER.
3. Remove MOTOR.
4. Remove roll pin from bowl lift arm.

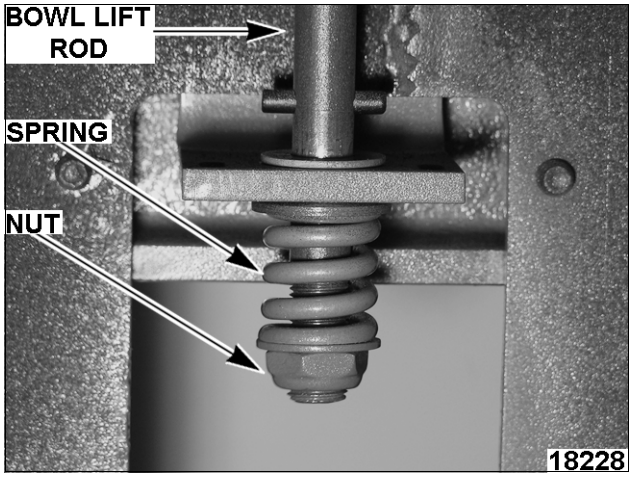


5. Remove bowl lift handle from pedestal.
6. Reassemble in reverse order.
7. Perform BOWL LIFT HANDLE ADJUSTMENT.

BOWL LIFT HANDLE ADJUSTMENT

NOTE: The bowl lift handle is in the up position when bowl is down. To raise the bowl, pull the bowl lift handle down. When the bowl support stops against the pedestal, the spring on the bowl lift rod is compressed to exert spring tension on the bowl lift arm and hold the bowl in position.

1. Raise bowl. Verify bowl stays in the up position.
   A. If force required is not too difficult for the operator and bowl stays in the up position, bowl is adjusted properly.
   B. If adjustment is required, continue with procedure.
2. Verify BOWL TO BEATER CLEARANCE ADJUSTMENT before adjusting bowl lift arm.
3. Remove PEDESTAL COVER.
4. Raise bowl to access the bowl lift rod stop nut.
   A. To *increase* lift handle force, turn nut clockwise approximately ½ turn. To *decrease* lift handle force, turn nut counterclockwise approximately ½ turn.
   B. Verify bowl lift arm operation and repeat the adjustment as necessary.

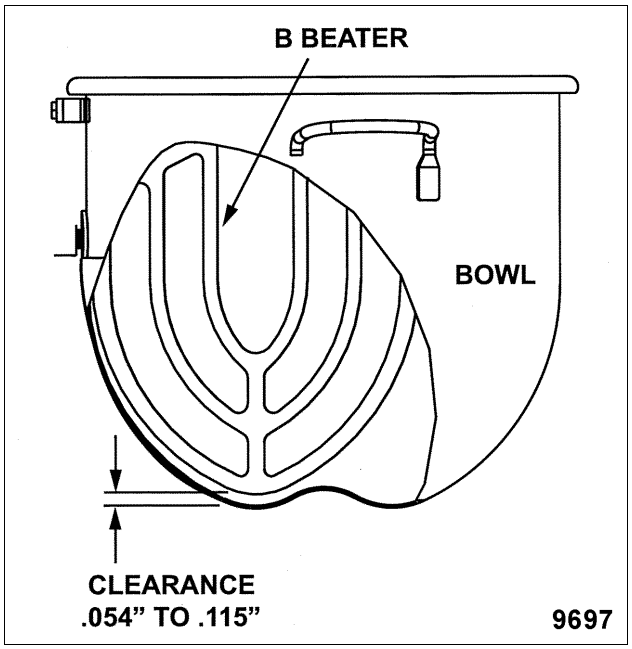


BOWL TO BEATER CLEARANCE ADJUSTMENT

WARNING: DISCONNECT THE ELECTRICAL POWER TO THE MACHINE AND FOLLOW LOCKOUT / TAGOUT PROCEDURES.

NOTE: Set the bowl to beater clearance using B beater.

1. Verify bowl to beater clearance is between 0.054" to 0.115" (allowable tolerance).



   A. If adjustment is required, continue with procedure.

2. Remove beater, unlock bowl and swing out of way.
3. Remove apron from pedestal.
4. Adjust each bowl height screw equally to obtain the correct bowl to beater clearance.
   A. Turn screw clockwise to increase or counterclockwise to decreases the clearance. Each half turn of the set screw equals approximately 0.025" of travel.
   B. Swing bowl into locked position and install beater.
   C. Check bowl to beater clearance for correct dimension.
   D. Repeat the adjustment as necessary until the correct bowl to beater clearance is achieved.
5. Install apron.
6. Check for proper operation.

ELECTRICAL OPERATION

COMPONENT FUNCTION

Motor Drive . . . . . Supplies power to 1MTR motor thru 1CR contacts, stores mixing time for each speed setting and controls motor speed. Removes power from control circuit thru N.C. timer ready contacts 30 B/C when mix time expires and sounds buzzer (countdown mode only). Monitors current, voltage, frequency and temperature during operation. Removes power from motor and displays alarm code on timer board if value exceeds the alarm setting.

1MTR Motor . . . . . Turns transmission to mix product.

Timer Board . . . . . Provides remote motor drive control and operator interface. Displays mix time and alarm codes. Includes: 1PB start switch, 2PB stop switch, time adjustment potentiometer, 1K relay and buzzer.

Recipe Timer Board . . . . . Provides the same control functions as the timer board but includes a programing option for the operator to store and retrieve up to four recipes with five steps each (various mix speeds & times). Includes: 3PB recipe mode switch, 4PB standard mode switch and 2K relay.

1PB Start Switch . . . . . N.O. - Provides initial power to control circuit (momentary on).

2PB Stop Switch . . . . . N.C. - Removes power from control circuit (momentary off).

Time Adjustment Potentiometer . . . . . Sets mix time from 00:10 seconds to 15:00 minutes (countdown mode only) or selects Hold Mode (continuous mixing with count up timing).

Buzzer . . . . . Signals end of mix time (countdown mode only) or signals 15:00 minutes of continuous mix time has elapsed (count up mode only). Buzzer sounds for one second then stops.

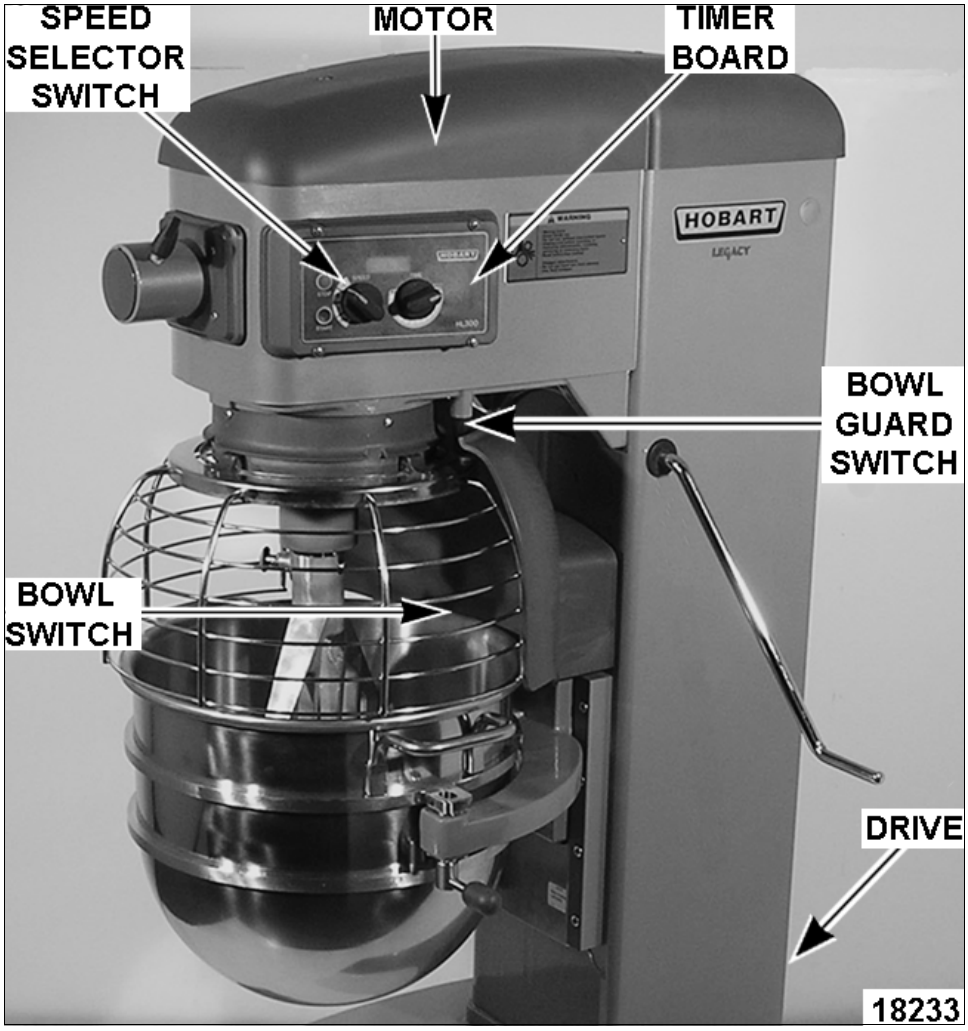
Speed Selector Switch . . . . . Sets agitator speed; or recipe number 1 thru 4 (recipe timer board only).

1CR Control Relay . . . . . Removes power from 1MTR motor when relay coil is de-energized by motor drive timer ready contacts 30 B/C (mix time expires or alarm), 2PB stop switch, 1LS bowl guard switch or 2LS bowl switch.

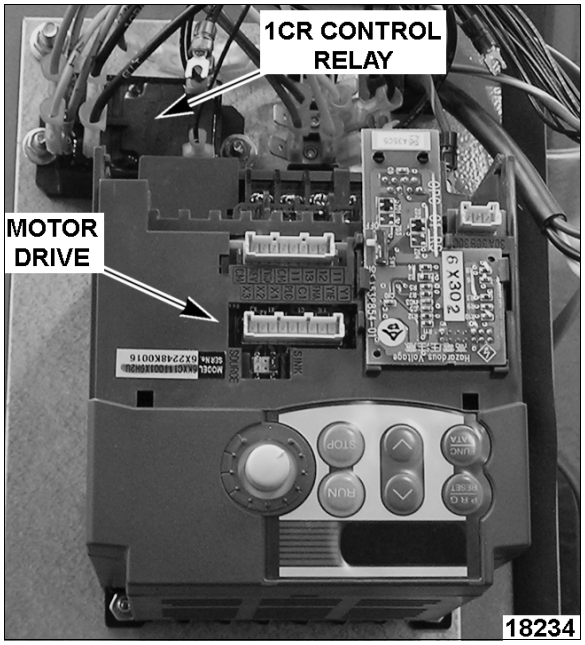
1LS Bowl Guard Switch . . . . . N.O. - Ensures bowl guard covers mixing bowl (reed switch closed) before mixer operation can begin.

2LS Bowl Switch . . . . . N.O. - Ensures bowl is raised into mixing position (reed switch closed) before mixer operation can begin.

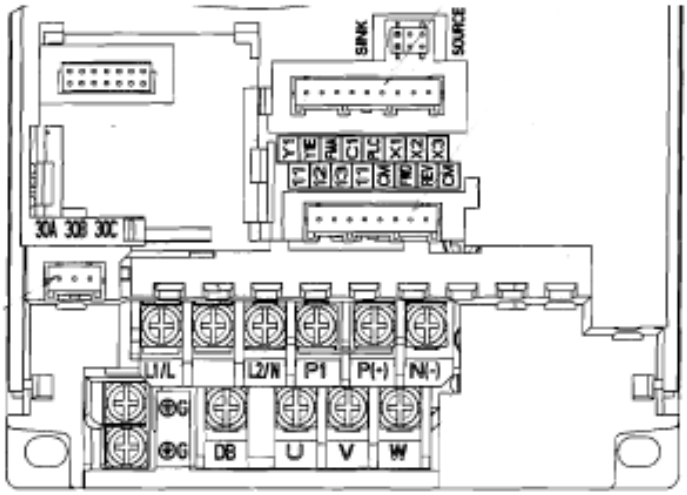
COMPONENT LOCATION



MIXER WITH STANDARD TIMER BOARD - HL300 SHOWN



MOTOR DRIVE LAYOUT HL300



--- LEGEND ---

CONTROL CIRCUIT TERMINALS

Y1 = COMMON (0VDC) OUTPUT TO BUZZER.
Y1E = COMMON (0VVDC) OUTPUT TO Y1.
PLC = 24VDC OUTPUT TO CONTROL CIRCUIT.
X1 = 0VDC OR 24VDC (ON/OFF) INPUT.
X2 = FROM SPEED SELECTOR SWITCH
X3 = (X3 ON RECIPE TIMER BOARD ONLY).
11 = COMMON OUTPUT TO TIME ADJ. POTENTIOMETER.
12 = 0 TO 10VDC INPUT TO MOTOR DRIVE FROM TIME ADJ. POTENTIOMETER.
13 = 0VDC OUTPUT TO TIME ADJ. POTENTIOMETER.
CM = COMMON.
FWD = INPUT TO MOTOR DRIVE TO ACTIVATE 3 PHASE VOLTAGE OUTPUT TO MOTOR (0VDC = ON)
30B/C = TIMER READY N.C. RELAY CONTACTS. PROVIDES COMMON (0VDC) OUTPUT TO CONTROL CIRCUIT.
RS485 = COMMUNICATIONS BETWEEN MOTOR DRIVE AND TIMER BOARD.

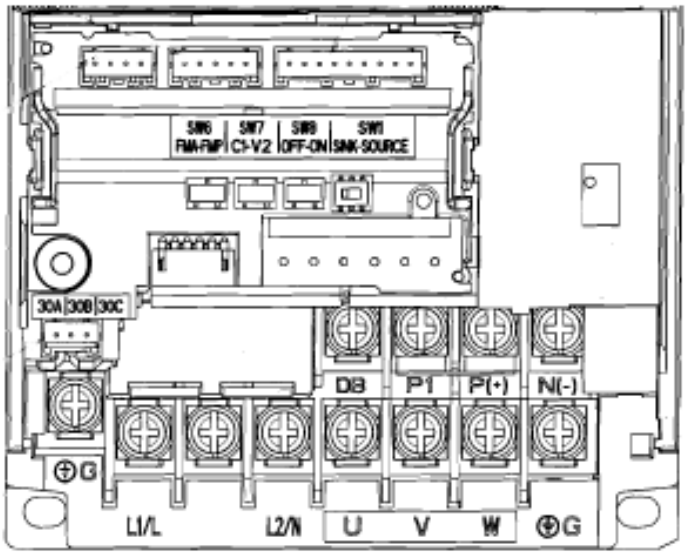
MAIN CIRUCIT TERMINALS

L1/L = LINE 1 AC VOLTAGE IN.
L2/N = LINE 2 OR NETURAL.
L3L/L = LINE 3 AC VOLATGE IN.
G = GROUND
U
V = 3 PHASE VOLTAGE
W OUTPUT TO MOTOR*

* OUTPUT VOLTAGE DEPENDS ON SPEED SETTING AND MIX LOAD.

18257

MOTOR DRIVE LAYOUT HL400



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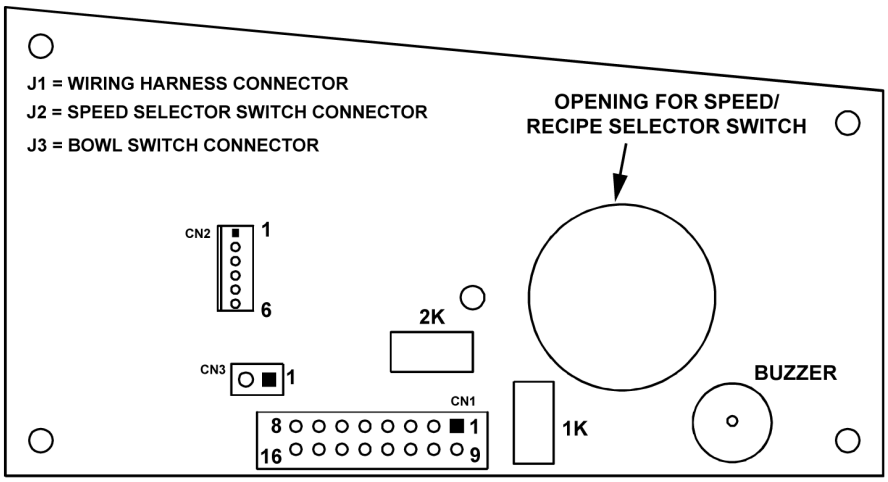
U
V = 3 PHASE VOLTAGE
W OUTPUT TO MOTOR*

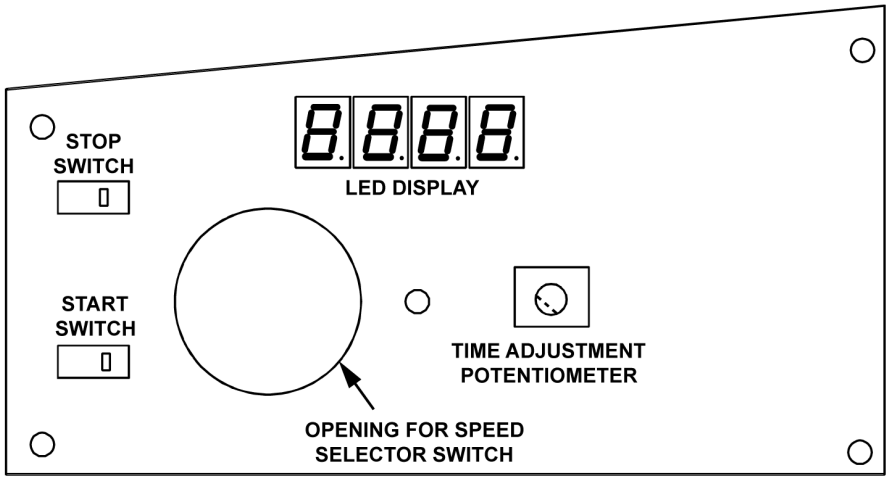
* OUTPUT VOLTAGE DEPENDS ON SPEED SETTING AND MIX LOAD.

18258

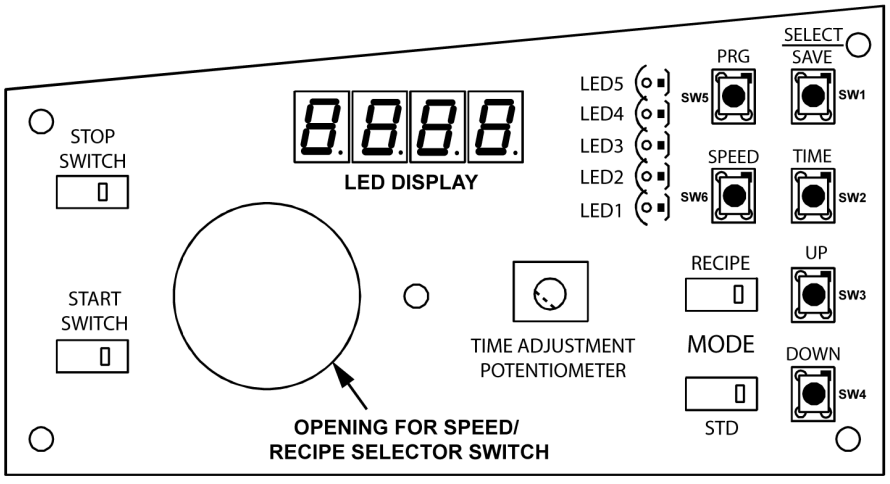
TIMER BOARD LAYOUT - HL300



REAR VIEW - TIMER BOARD OR RECIPE TIMER BOARD



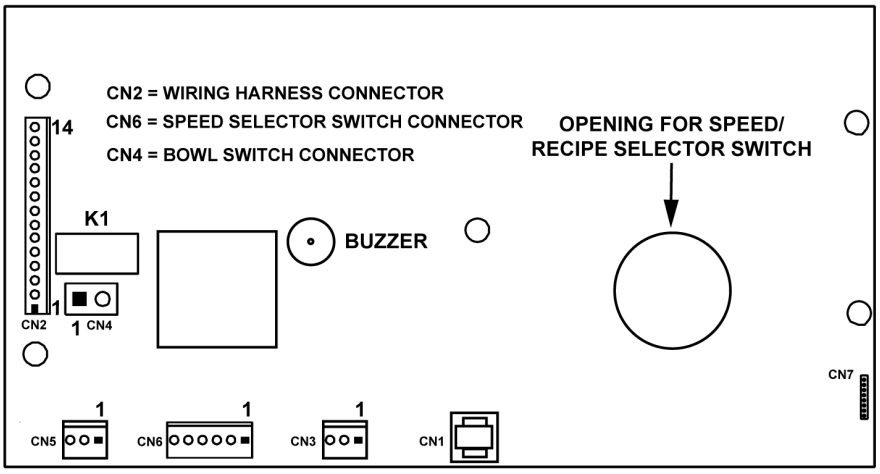
FRONT VIEW - TIMER BOARD



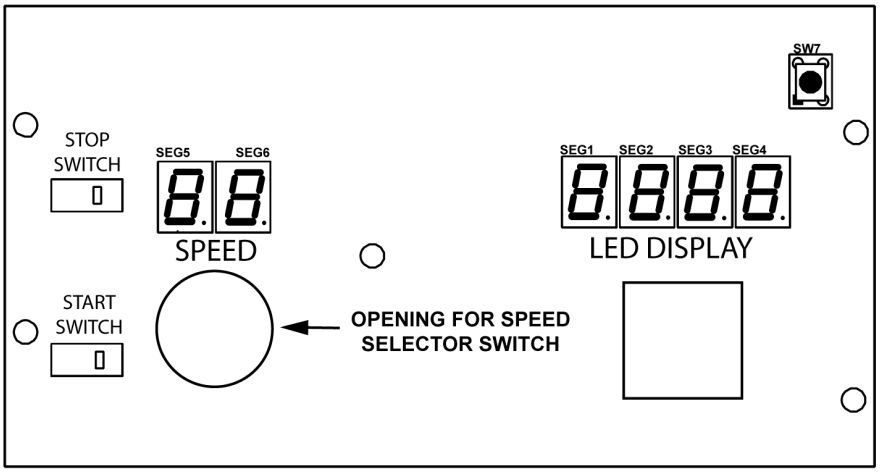
FRONT VIEW - RECIPE TIMER BOARD

AI2051

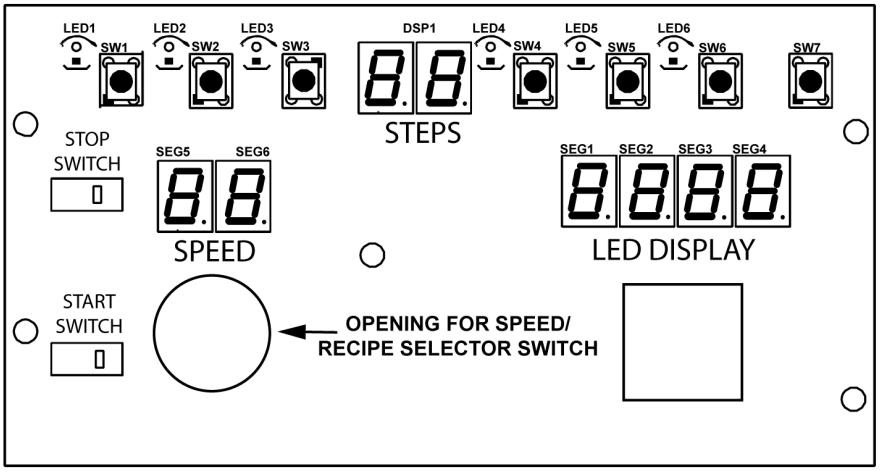
TIMER BOARD LAYOUT - HL400



REAR VIEW - TIMER BOARD OR RECIPE TIMER BOARD



FRONT VIEW - TIMER BOARD



FRONT VIEW - RECIPE TIMER BOARD

SEQUENCE OF OPERATION

HL300 Mixer - Standard Timer Board

Refer to wiring diagram AI2036 for the electrical sequence of operation.

NOTE: The position of the time knob selects timer mode (countdown or count up). Set mix time between 00:10 seconds and 15:00 minutes, press 1PB start switch and timer counts down to zero then stops.

Rotate the time knob CCW until timer displays Hold and enters count up mode. Press 1PB start switch and the timer counts up continuously until 2PB stop switch is pressed.

1. Conditions.
   - A. Mixer connected to correct supply voltage and is properly grounded.
     1) Motor drive energized and self check performed.
     2) Motor drive passes self check and displays mix time or Hold.

     NOTE: The mix time will be the last time setting used for the speed selection (stir, speed 1, speed 2, speed 3).
     3) Motor drive PLC provides 24VDC to control circuit.
     4) Motor drive timer ready N.C. contacts 30 B/C provide the common to control circuit (common = 0VDC).
   - B. 1PB start switch N.O. contacts open.
     1) 1K N.O. latching circuit contacts open.
     2) 1K N.O. run contacts open.
   - C. 2PB stop switch N.C. contacts closed.
   - D. 1CR relay N.O. contacts 8/6 & 4/2 open.
   - E. 1LS bowl guard switch open.
     1) Wire cage of bowl guard open.
   - F. 2LS bowl switch open.
     1) Bowl down and swung out.
2. Bowl placed on support as instructed in operator manual.
3. Bowl swung in, raised to mix position and locked.
   - A. 2LS bowl switch closed.
4. Wire cage of bowl guard closed.
   - A. 1LS Bowl guard switch closed.
5. Set time and speed.
6. 1PB start switch operated (closed).
   - A. 1K relay coil initially energized thru 2PB stop switch and 1LS bowl switch.
     1) 1K run contacts close and provide the common signal (0VDC) to motor drive FWD.
     2) When 1PB start switch is released, 1K relay coil remains energized thru 1K latching circuit contacts.
   - B. 1CR relay coil energized and 1CR contacts 8/6 & 4/2 close.
7. With the common signal (0VDC) present at FWD, motor drive controls and monitors mixer operation.
   - A. Motor drive activates U, V, & W 3 phase voltage output to 1M motor.

   NOTE: The motor drive varies the frequency and voltage output depending on speed setting and mix load.
   - B. Speed selector switch routes the motor drives internal voltage signals of 0VDC or 24VDC to motor drive X1 & X2.
     1) Motor drive evaluates the voltage signals at X1 & X2 and selects the speed.
   - C. 1M motor is energized thru 1CR contacts.
   - D. Timer starts (countdown or count up).
     1) Depending on time knob position, the time adjustment potentiometer provides 0VDC to 10VDC from J-6 to motor drive 12.
8. Motor remains energized until one of the following occurs.
   - A. 2PB stop switch opened.
   - B. 1LS bowl guard switch opened.
   - C. 2LS Bowl switch opened.
   - D. Timer reaches 00:00.
9. When 2PB stop switch is opened; or bowl guard is opened; or bowl is unlocked or lowered.
   - A. 1CR relay coil de-energized and 1CR 8/6 & 4/2 contacts open.
     1) Power removed from 1M motor.
   - B. 1K relay coil de-energized and 1K latching circuit contacts open.
     1) 1K run contacts open and remove common signal (0VDC) from motor drive FWD.

     With signal removed from FWD, motor drive stops mixer operation.
     2) Motor drive de-activates U, V, & W 3 phase voltage output.

3) Motor drive timer ready contacts 30 B/C open for 1 second to remove common signal (0VDC) from control circuit and then re-close.

4) Remaining mix time is shown in display.

10. When timer reaches 00:00 minutes (countdown mode only).

A. Motor drive timer ready contacts 30 B/C open for 1 second to remove common signal (0VDC) from control circuit and then re-close.

B. 1CR relay coil is de-energized and 1CR 8/6 & 4/2 contacts open.

1) Power is removed from 1M motor.

C. 1K relay coil de-energized and 1K latching circuit contacts open.

1) 1K run contacts open and remove common signal (0VDC) from motor drive FWD.

With signal removed from FWD, motor drive stops mixer operation.

2) Motor drive de-activates U, V, & W 3 phase voltage output.

3) Motor drive activates Y1 and provides the common for 1 second to energize buzzer (buzzer sounds) then turns off.

NOTE: The common from Y1 is provided thru the electronic control circuit of the motor drive and the external jumper connection between Y1E and CM.

4) Mix time shown in display.

D. Mixer is ready for next time and speed operation or bowl removal.

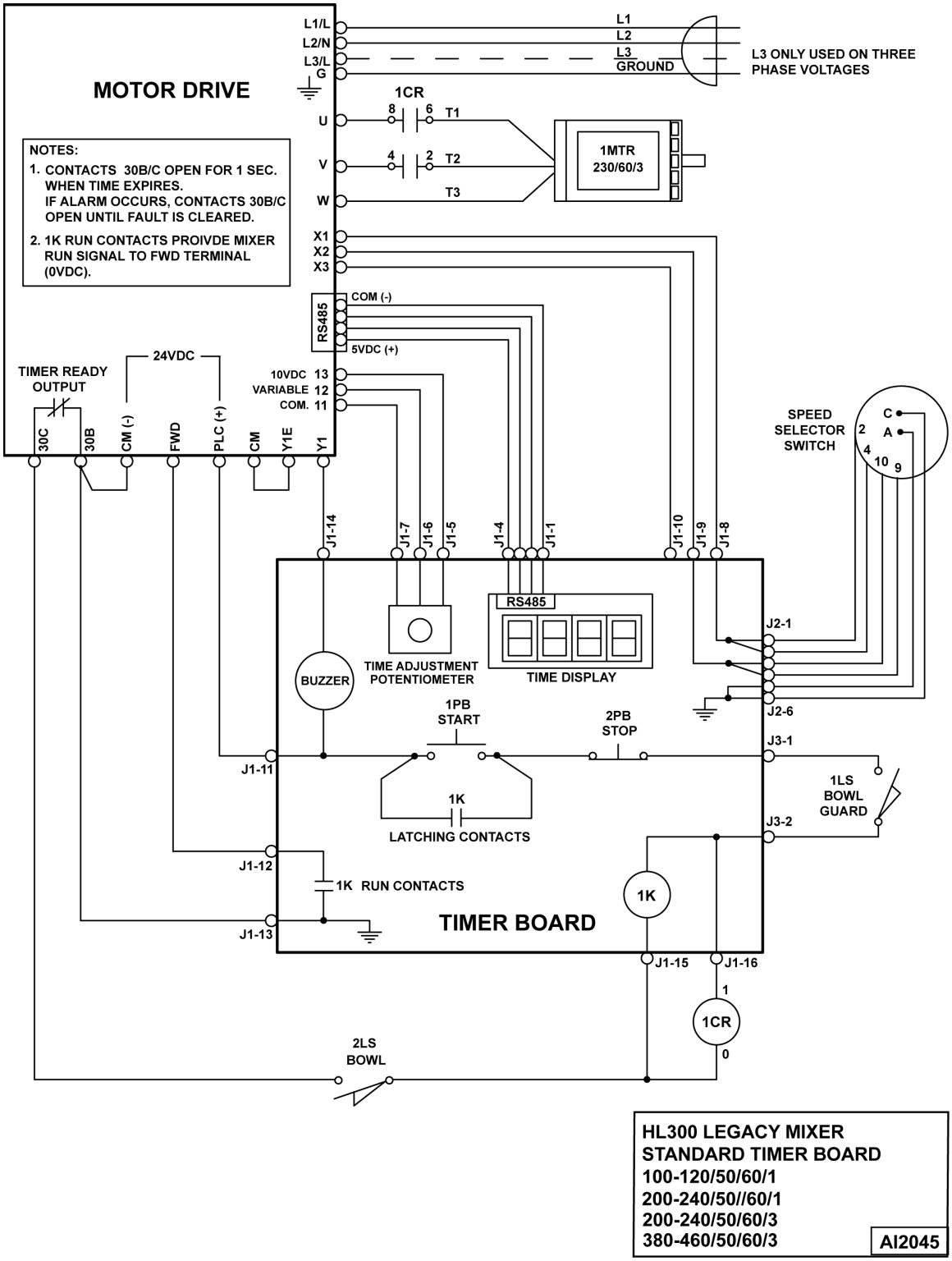
11. When timer reaches 15:00 minutes (count up mode only).

A. Motor drive activates Y1 and provides the common for 1 second to energize buzzer (buzzer sounds) then turns off.

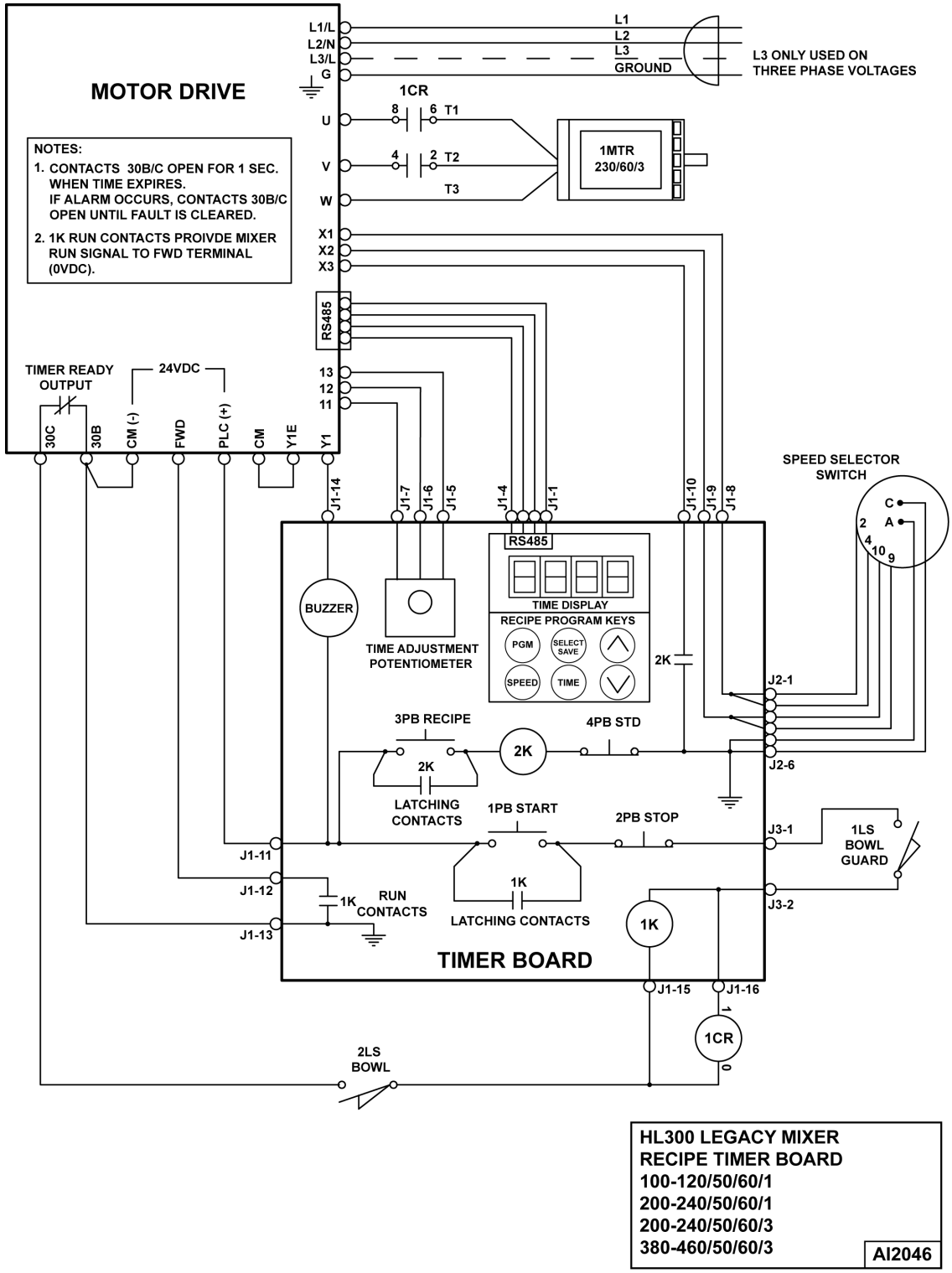
B. Timer resets to 00:00. Timer and mixer operation continue until 2PB stop switch is pressed or power is removed from mixer.

SCHEMATIC DIAGRAMS

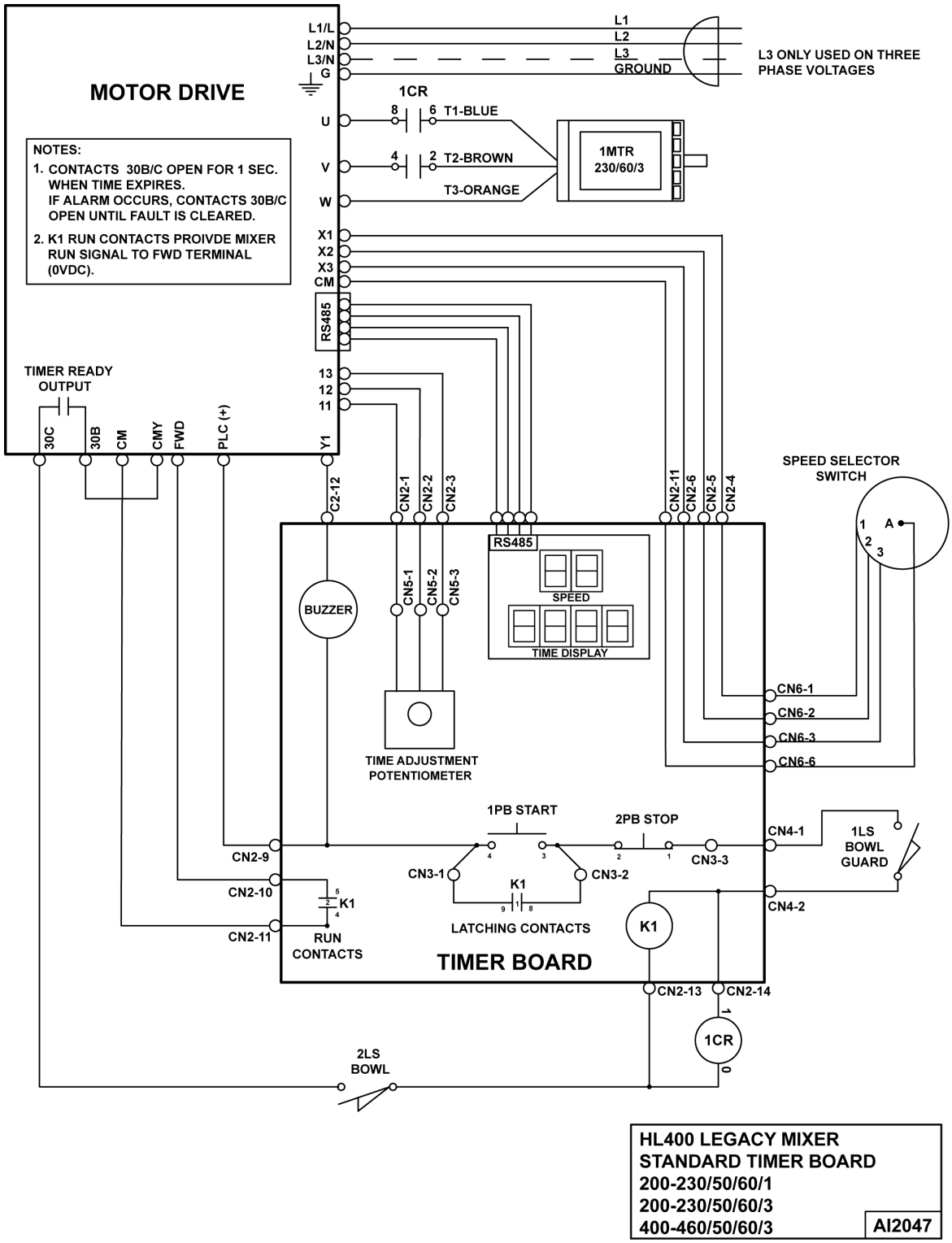
HL300 Mixer - Standard Timer Board



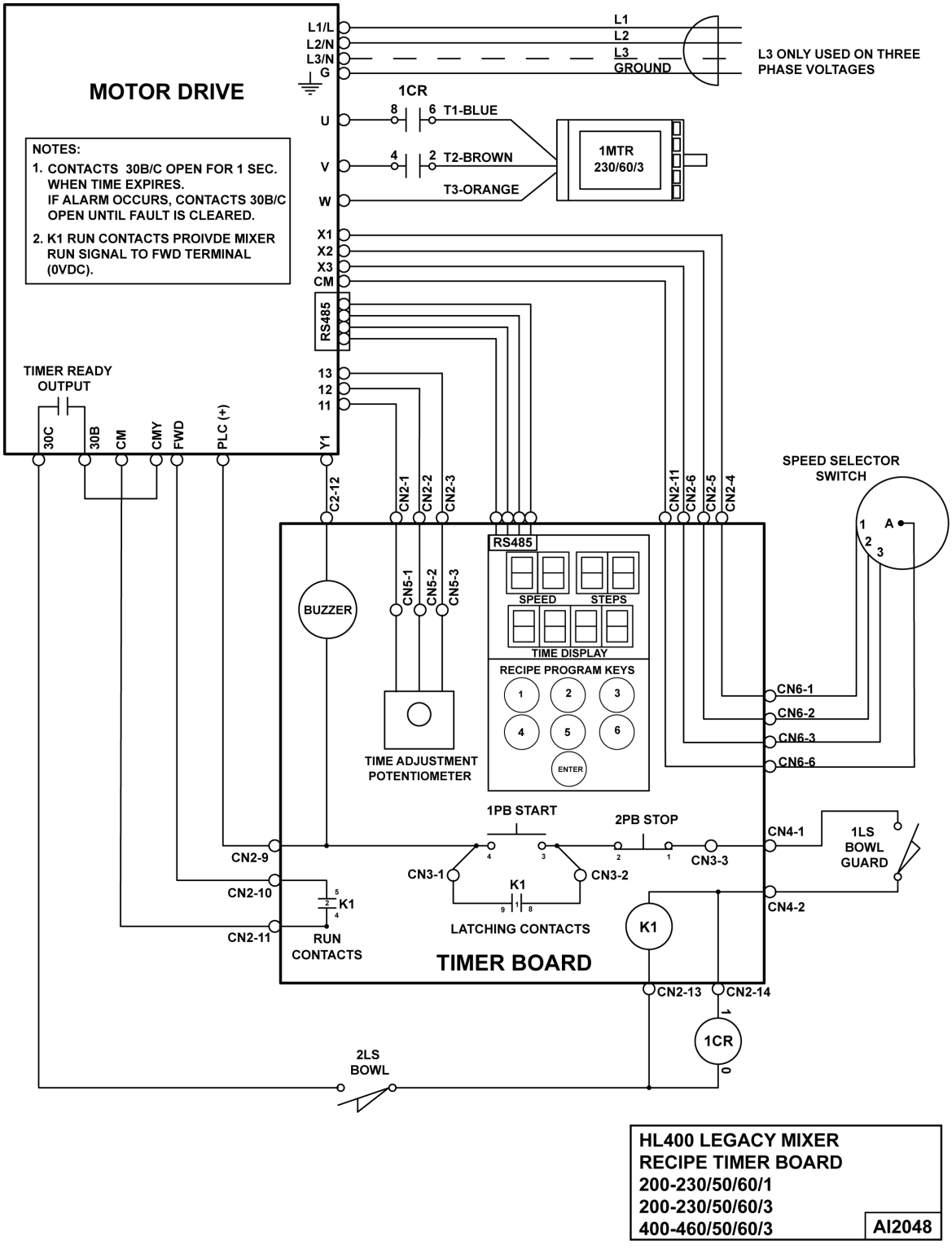
HL300 Mixer - Recipe Timer Board



HL400 Mixer - Standard Timer Board

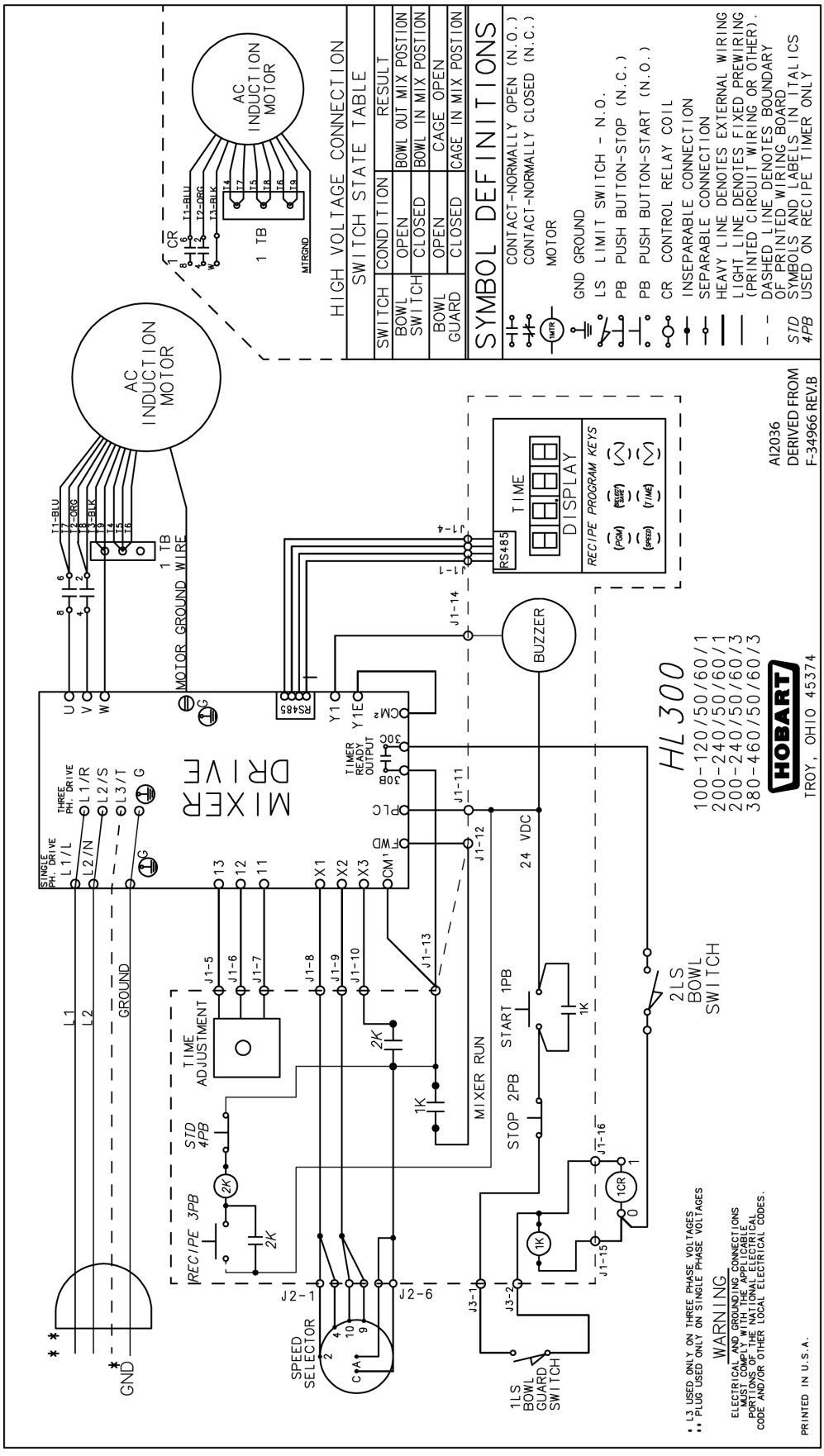


HL400 Mixer - Recipe Timer Board

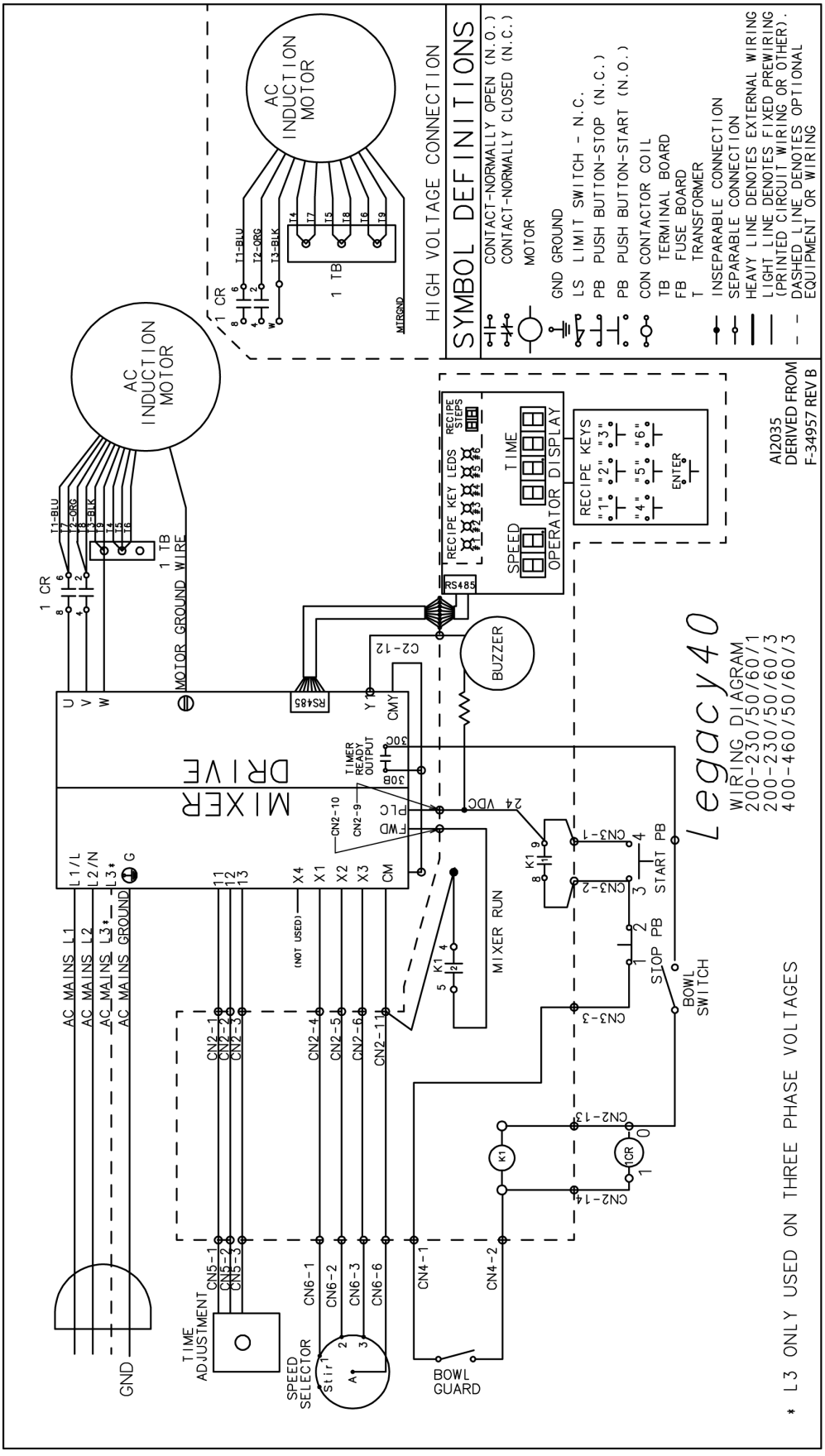


WIRING DIAGRAMS

HL300 Mixer

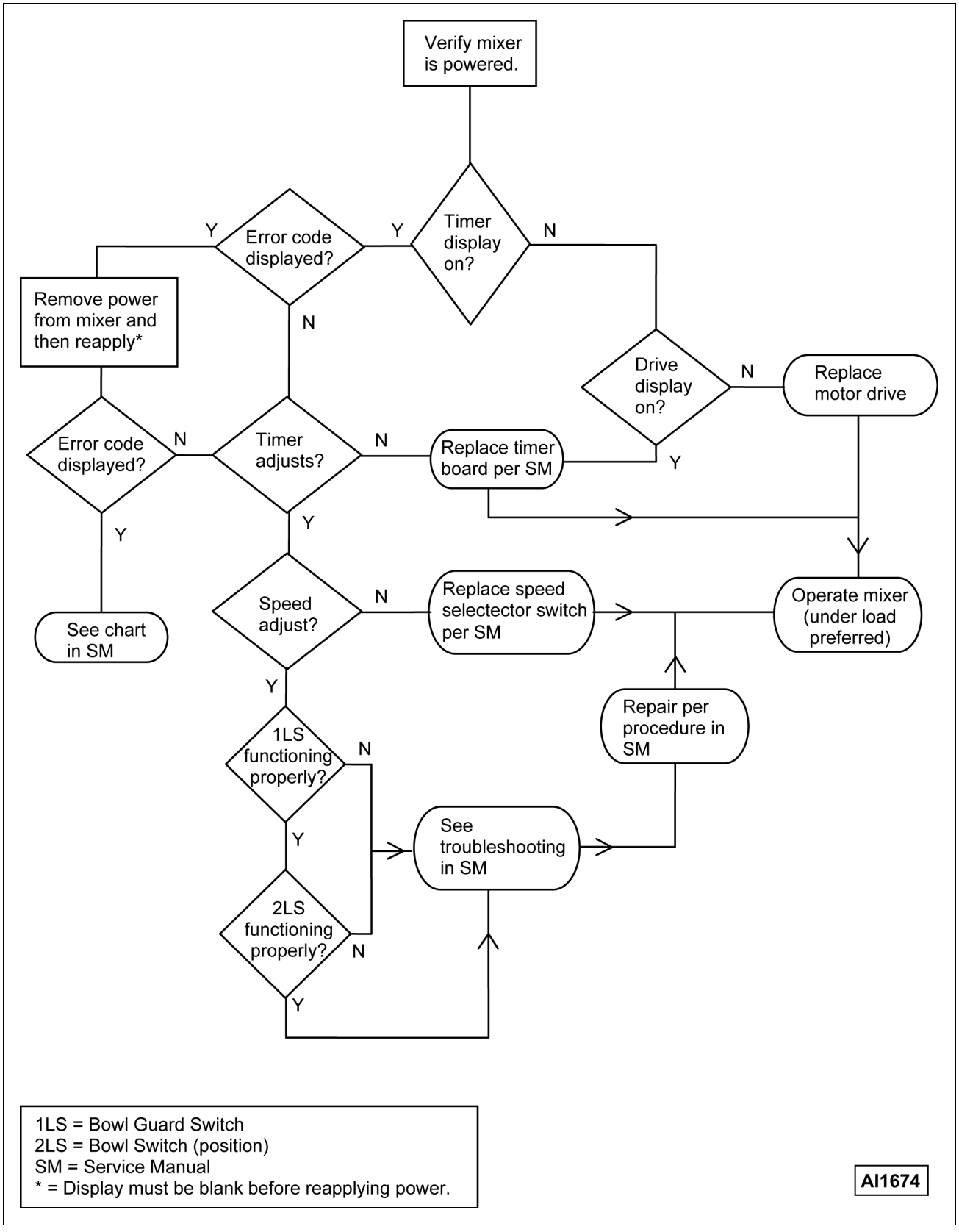


HL400 Mixer


SYMBOL DEFINITIONS
CONTACT-NORMALLY OPEN (N.O.)
CONTACT-NORMALLY CLOSED (N.C.)
MOTOR
GND GROUND
LS LIMIT SWITCH - N.C.
PB PUSH BUTTON-STOP (N.C.)
PB PUSH BUTTON-START (N.O.)
CON CONTACTOR COIL
TB TERMINAL BOARD
FB FUSE BOARD
T TRANSFORMER
INSEPARABLE CONNECTION
SEPARABLE CONNECTION
HEAVY LINE DENOTES EXTERNAL WIRING
LIGHT LINE DENOTES FIXED PREWIRING (PRINTED CIRCUIT WIRING OR OTHER).
DASHED LINE DENOTES OPTIONAL EQUIPMENT OR WIRING
HIGH VOLTAGE CONNECTION
AC INDUCTION MOTOR
1 CR
1 TB
T1-BLU
T2-ORG
T3-BLK
MTRGND
MOTOR GROUND WIRE
RECIPE KEY LEDS
RECIPE STEPS
TIME
SPEED
OPERATOR DISPLAY
RECIPE KEYS
"1" "2" "3"
"4" "5" "6"
ENTER
RS485
BUZZER
MIXER DRIVE
TIMER READY OUTPUT
24 VDC
MIXER RUN
START PB
STOP PB
BOWL SWITCH
AC MAINS L1
AC MAINS L2
AC MAINS L3*
AC MAINS GROUND
GND
TIME ADJUSTMENT
SPEED SELECTOR
BOWL GUARD
(NOT USED)
Legacy40
WIRING DIAGRAM
200-230/50/60/1
200-230/50/60/3
400-460/50/60/3
AI2035
DERIVED FROM
F-34957 REV B
* L3 ONLY USED ON THREE PHASE VOLTAGES

TROUBLESHOOTING

QUICK REFERENCE FLOW CHART



NOTE: If ALARM code is displayed on timer board, refer to ALARM CODES for complete description.

GENERAL - ALL MODELS	
SYMPTOM	**POSSIBLE CAUSE**
Mixer will not run (no timer board display).	1. No voltage to machine. 2. Timer board malfunction. 3. Wiring harness connections loose or malfunction. 4. Motor drive malfunction.
Mixer will not run (timer board display on).	1. 1LS bowl guard switch open or malfunction. Verify magnet in place on bowl guard and bowl guard switch operation. 2. 2LS bowl switch open or malfunction. Verify magnet in place on bowl (rear) and bowl switch operation. 3. Timer board malfunction. 1K run contacts are open (no input signal to motor drive FWD terminal); 1PB start switch or 2PB stop switch malfunction. 4. 1CR control relay malfunction. 5. Motor drive malfunction (timer ready contacts 30 B/C are open). 6. Motor malfunction. 7. Wiring harness connections loose or malfunction.
Mixer will not run, but timer board counts up/down when start button is pushed.	1. 1CR control relay malfunction. 2. Wiring harness connections loose or malfunction. 3. Timer board malfunction. 4. Motor drive malfunction (timer ready contacts 30 B/C are open). 5. Motor malfunction.
Mixer runs, but stops when 1PB start switch is released.	1. Timer board malfunction (1K latching contacts not closing).
Mixer runs continuously, but will stop when 2PB stop switch is held IN, or bowl guard is opened, or bowl is lowered.	1. Timer board malfunction (1PB start switch momentary contacts not opening; or 1K latching contacts not opening).
Mixer motor hums and does not run.	1. Supply voltage out of tolerance. 2. 1CR control relay malfunction. 3. Motor drive malfunction. 4. Motor malfunction. 5. Transmission malfunction. 6. Batch size too large. See REFERENCE MATERIAL under GENERAL.
Mixer shuts off during operation.	1. Supply voltage out of tolerance. 2. Batch size too large. See REFERENCE MATERIAL under GENERAL. 3. Wiring incorrect from motor drive to motor. 4. Motor overheated or malfunction. 5. Motor drive overheated or malfunction. 6. Timer board malfunction. 7. 2LS bowl switch open or malfunction. 8. 1LS bowl guard switch open or malfunction.

GENERAL - ALL MODELS	
SYMPTOM	**POSSIBLE CAUSE**
Mixer lacks power.	1. Supply voltage out of tolerance. 2. Batch size too large. See REFERENCE MATERIAL under GENERAL. 3. Wiring incorrect from motor drive to motor. 4. Motor drive malfunction. 5. Motor malfunction. 6. Transmission malfunction.
Mixer motor runs backwards.	1. Wiring incorrect from motor drive to motor. 2. Motor drive malfunction.
Mixer noisy.	1. Motor malfunction. 2. Transmission gears worn (improperly meshing), low on grease or damaged. 3. Bevel gear assembly or planetary shaft bevel gear worn (improperly meshing) or damaged. 4. Internal gear and beater pinion of planetary are worn (improperly meshing) or low on grease. 5. Worn bearings (agitator shaft, planetary shaft or worm wheel shaft). 6. Wiring incorrect from motor drive to motor. 7. Motor drive malfunction.
Mixer motor runs, but planetary does not rotate.	1. Key sheared at: A. Worm on motor shaft. B. Worm wheel shaft. C. Middle key on planetary shaft. D. Lower key on planetary shaft. 2. Planetary or worm wheel shaft broken.
Mixer planetary operates, but attachment hub does not rotate.	1. Upper key sheared on planetary shaft. 2. Bevel gear assembly or planetary shaft bevel gear worn (improperly meshing) or damaged.
Agitator will not turn.	1. Key sheared at beater pinion on agitator shaft.
Not mixing ingredients at bottom of bowl.	1. Bowl to beater clearance set incorrectly. 2. Batch recipe incorrect. See REFERENCE MATERIAL under GENERAL. 3. Incorrect agitator for recipe.
Mixer appears to run in wrong speed.	1. Speed selector switch malfunction. 2. Motor drive X1, X2, X3 or CM terminal connections loose, wired incorrectly or wiring harness malfunction. 3. Motor drive malfunction. 4. Motor malfunction.
Mixer runs in one speed only. (Changing speed selector switch has no affect)	1. Speed selector switch malfunction. 2. Motor drive X1, X2, X3 or CM terminal connections loose, wired incorrectly or wiring harness malfunction. 3. Motor drive malfunction. 4. Motor malfunction.

GENERAL - ALL MODELS	
SYMPTOM	**POSSIBLE CAUSE**
Timer board problems: Can not adjust time. Can not select Hold Mode (continuous mixing with count up timing). Timer display does not count up. Timer display does not count down. Timer display blank. Segment missing from timer display. Mixer will not shut off at end of timed cycle.	1. Timer board malfunction (time adjustment potentiometer; or other problems with the board). 2. Wiring harness connections from motor drive RS485 to timer board are disconnected or malfunctioning. 3. Motor drive malfunction (timer ready contacts 30 B/C are not opening for 1 second at the end of timed cycle.
Grease leaking from planetary.	1. Spacer o-ring on planetary shaft.
Grease leaking from attachment hub.	1. Quad ring in attachment hub.

NOTE: The motor drive constantly monitors its operation while the mixer is running. If an alarm occurs during mixer operation, the motor drive recognizes a fault condition and immediately tries to reset the fault twice within 0.5 second intervals. If mixer operation continues, the automatic reset was successful. If the alarm was not reset, the motor drive enters Alarm Mode and displays a 3-digit alarm code that corresponds to the fault. The mixer will not operate until the alarm is cleared. To manually reset, cycle power to mixer. Wait till display goes out then reconnect power.

ALARM CODES			
Alarm Code	**Fault Description**	**Possible Causes**	**Suggested Actions**
OC1 OC2 OC3	Over current (Protects motor drive)	1. Low supply voltage. 2. Momentary power interruption. 3. Batch size too large. 4. Motor drive terminals U, V or W short-circuited or grounded.	1. Check supply voltage to mixer. 2. Cycle power to mixer. Wait till display goes out then reconnect power. 3. Reduce batch size. See REFERENCE MATERIAL under GENERAL. 4. Check motor lead wire connections. 5. Check motor resistance. 6. Check resistance between motor drive terminals U, V & W.
OU1 OU2 OU3	Over voltage (DC Bus voltage ≥373V)	1. High supply voltage.	1. Check supply voltage to mixer.
LU	Under voltage (DC Bus voltage ≤255V)	1. Low supply voltage. 2. Momentary power interruption. 3. Motor drive malfunction.	1. Check supply voltage to mixer. Leave DMM connected and check for sudden drops in supply voltage when mixer is turned ON (under load) along with other equipment on the same line. 2. Cycle power to mixer. Wait till display goes out then reconnect power. 3. Check DC bus circuit voltage at terminals P(+) & N (-). If voltage reading is consistently low and supply voltage is within tolerance, replace motor drive.

ALARM CODES			
Alarm Code	**Fault Description**	**Possible Causes**	**Suggested Actions**
OPL or OP1	Output phase loss to motor.	1. Lead wire or connection malfunction to motor.	1. Check motor lead wire connections for tightness and continuity. If connections are loose then tighten. If a problem is found with the lead wires from motor drive to motor, replace the malfunctioning component (wiring harness; or motor).
		2. Open circuit in motor windings.	2. Check motor resistance.
		3. Single phase motor installed; or motor not wired for 3 phase.	3. Motor drive requires a 3 phase AC motor. Verify this type of motor is installed and is wired for 3 phase.
		4. 1CR control relay malfunction.	4. Check for 24VDC at 1CR relay coil. If voltage is present but 1CR contacts 6/8 or 2/4 are not closing, replace 1CR control relay. If 24VDC is not present, check voltage at motor drive terminals 30C to PLC and verify 1LS bowl switch and 2LS bowl guard switch are closed. If a problem is found with 1LS, 2LS or motor drive, replace the malfunctioning component.
		5. Motor drive malfunction (no output voltage; or output voltage phase lost).	5. Replace motor drive.
OH1	Over heating at heat sink. (Protects motor drive)	1. Motor drive heat sink temperature above 194°F.	1. Disconnect power to mixer and allow motor drive to cool.
		2. Motor drive malfunction.	2. Check bottom cover vent for clogging. Check motor drive heat sink fins for clogging. Remove debris.
			3. Reduce room ambient temperature; or move mixer to a cooler location (away from heat sources).
			4. If over heating occurs repeatedly, replace motor drive.
OL1 OL2	Electronic thermal overload relay tripped. (Protects motor)	1. Mixing in Stir speed.	1. Select Speed 1 or Speed 2 for mixing.
		2. Batch size too large.	2. Reduce batch size. See REFERENCE MATERIAL under GENERAL.
		3. Low supply voltage causing low motor torque.	3. Check supply voltage to mixer.
		4. Motor malfunction.	4. Check motor resistance.
		5. Motor drive malfunction.	5. Replace motor drive.

ALARM CODES			
Alarm Code	**Fault Description**	**Possible Causes**	**Suggested Actions**
OLU	Motor drive over loaded. (Protects motor drive)	1. Batch size too large. 2. Motor drive ambient temperature above 122°F.	1. Reduce batch size. See REFERENCE MATERIAL under GENERAL. 2. Check bottom vent cover for clogging. Check motor drive heat sink fins for clogging. Remove debris. 3. Reduce room ambient temperature; or move mixer to a cooler location (away from heat sources).
Er1	Memory error.	1. Momentary power interruption or power loss while motor drive was storing data.	1. Cycle power to mixer. Wait till display goes out then reconnect power. If this does not clear the alarm code, replace motor drive.
Er2	Timer board communication error.	1. RS485 wiring connections loose, disconnected or malfunctioning. 2. Timer board malfunction. 3. Motor drive malfunction.	1. Check plugs for proper insertion into sockets (RJ45 and 16 pin). 2. Check RS485 lead wire connections J1-1 thru J1-4 for tightness and proper insertion into 16 pin sockets and plugs from motor drive to timer board. If no continuity, replace the malfunctioning harness. 3. Replace timer board (if harness ok). 4. Replace motor drive (if timer board and harness ok).
Er3	CPU error.	1. Motor drive malfunction.	1. Cycle power to mixer. Wait till display goes out then reconnect power. If this does not clear the alarm code, replace motor drive.
ErF	Data save error during undervoltage.	1. Momentary power interruption or power loss while motor drive was storing data.	1. Cycle power to mixer. Wait till display goes out then reconnect power. If this does not clear the alarm code, replace motor drive.
Lin	Input phase loss	1. Main circuit power input wires broken. 2. Terminal screws for the main circuit power input at the inverter are not tight enough. 3. Single-phase voltage applied to three phase input of inverter.	1. Measure input voltage. 2. Tighten terminal screws to the recommended torque. 3. Check the inverter type. Apply three-phase power. Three phase inverter cannot be driven by single-phase power supply.

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